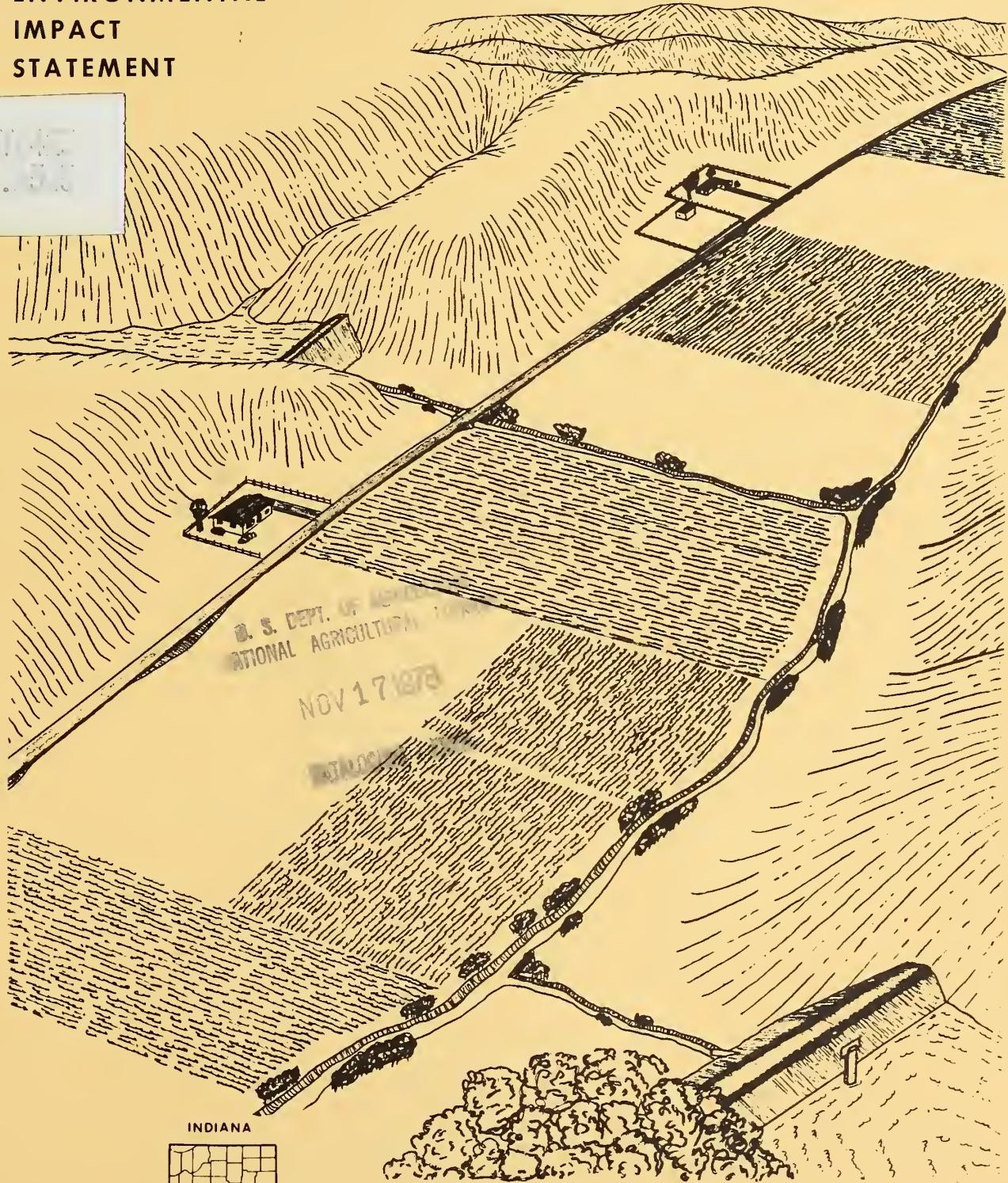


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ANDERSON RIVER WATERSHED INDIANA

ENVIRONMENTAL IMPACT STATEMENT



FEDERAL ASSISTANCE THROUGH P.L. 566
83rd Congress, 68 Stat. 666, as amended

U. S. Department of Agriculture
Soil Conservation Service

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Anderson River Watershed Project

Crawford, Dubois, Perry and Spencer Counties, Indiana

FINAL ENVIRONMENTAL IMPACT STATEMENT

Cletus J. Gillman
State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Crawford County Soil and Water Conservation District
English, Indiana 47118

Dubois County Soil and Water Conservation District
Jasper, Indiana 47546

Perry County Soil and Water Conservation District
Cannelton, Indiana 47520

Spencer County Soil and Water Conservation District
Rockport, Indiana 47635

Perry County Park and Recreation Board
Tell City, Indiana 45586

Town of Birdseye
Birdseye, Indiana 47513

Anderson River Conservancy District
Saint Meinrad, Indiana 47577

State of Indiana
Indiana Department of Natural Resources
Indianapolis, Indiana 46209

July 1975

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Indianapolis, Indiana 46224



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USDA ENVIRONMENTAL IMPACT STATEMENT

Anderson River Watershed Project
Crawford, Dubois, Perry and Spencer Counties
Indiana

Prepared in Accordance with
Sec. 102(2)(C) of P.L. 91-190

II. Summary Sheet

- I. Final.
- II. Soil Conservation Service.
- III. Administrative.
- IV. Description of Action:

A project for watershed protection, flood prevention, municipal and industrial water supply and recreation in Crawford, Dubois, Perry and Spencer Counties, Indiana, to be implemented under authority of the Watershed Protection and Flood Prevention Act (PL-566, 83d Congress, 68 Stat. 666), as amended.

V. Summary of Environmental Impacts

Reduce annual erosion from 553,892 tons to 427,566 tons per year, a 23 percent reduction. Reduce sediment concentrations in stream flows by 50 percent. Stabilize 310 acres having critical erosion problems. Implementation of wildlife habitat management and development plans on 1,038 acres. Create 170 farm ponds complementing pasture enterprises and enhancing fish and wildlife values. Cause land use shifts consistent with long run capabilities through a reduction in cropland of 7,665 acres, and increase in land devoted to pasture use of 8,012 acres, and an increase in land managed for woodland purposes of 1,978 acres, and a reduction in land in other uses of 2,325 acres. Reduce watershed flood damages by 48 percent. Reduce the inflow of fertilizers, pesticides and animal wastes into watershed streams.

Reduce flood plain scour on 369 acres. Create a major outdoor recreation industry complementing many of the area's scenic and historical points of interest. Two lakes with a combined surface area of 806 acres will provide an estimated 175,125 recreation visits annually. Create an additional 297 acres of open water beneficial to fish and wildlife values. Provide the Town of Birdseye with 100 acre-feet of industrial water supply. Provide the Saint Meinrad Archabbey with 120 acre-feet of municipal water supply. Create an uplift in the overall watershed economy through secondary business support activities generated by the project. Sustain the stream fishery below reservoir Nos. U-1 and U-10 through the release of cool oxygenated water.

Periodically create 623 acres of aquatic wildlife habitat in flood pool areas. Eliminate agricultural use of 560 acres in cropland and pastureland and 714 acres in forest land, in dam, emergency spillway and permanent pool areas of planned reservoirs. Change 3 acres of cropland use, 47 acres of pastureland use and 106 acres in forest land use to recreation use by the recreation facilities at reservoir U-10. Produce local area reductions in the amount of wildlife habitat available through the inundation of 1,103 acres in reservoir permanent pools (includes 482 acres of cropland and pastureland, 616 acres of forest land and 5 acres of roads.). Interrupt pasturing activities and wildlife use on 273 acres of pastureland in reservoir flood pool areas and wildlife use on an additional 350 acres of forest land. Reduce wildlife habitat by allowing for the economic conversion of 75 acres of pastureland and 145 acres of forest land to cropland through the reduction of flood damages. Produce a temporary damaging effect to downstream fisheries during channel construction and subsequent maintenance operations. Inundate approximately 12.1 miles of perennial warm water stream fishery and 8.5 miles of intermittent feeder streams within permanent pool areas of reservoirs. Move the Blunk cemetery from the pool area of reservoir No. U-10. Increase vehicular traffic in the watershed. Periodically disrupt terrestrial wildlife use on 623 acres of land in reservoir flood pools. Temporarily disturb wildlife and wildlife habitat during mowing operations on areas of dams and emergency spillways. Remove 80 trees along 10.5 miles of channel.

VI. List of Alternatives Considered

- a. Land treatment only.
- b. Combination of reservoirs, excavated channel, and land treatment.
- c. Channel only.
- d. Combination of reservoirs and channel trash and debris removal.
- e. Flood plain zoning.
- f. No project.

VII. Agencies From Which Comments Have Been Received

- a. Department of the Army
- b. Environmental Protection Agency
- c. Department of the Interior
- d. Advisory Council On Historic Preservation
- e. State of Indiana, Department of Natural Resources
- f. Department of Transportation, U.S. Coast Guard
- g. Department of Health, Education, and Welfare

VIII. Draft Environmental Impact Statement Transmitted to CEQ on February 18, 1975.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

for

Anderson River Watershed, Indiana

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

Sponsoring Local Organizations

Crawford, Dubois, Perry and Spencer County Soil and Water Conservation Districts, Perry County Park and Recreation Board, Anderson River Conservancy District, Town of Birdseye and the State of Indiana.

PROJECT PURPOSES

Watershed Protection

One goal of the project sponsors and the Soil Conservation Service is to reduce the recognized problem of excessive erosion on watershed land. Soil losses can be reduced in two ways: 1) by voluntary changes in the use of seriously eroding land to some use that would protect the soil resource; 2) by applying vegetative and structural measures on eroding land to protect the soil resource without significantly changing the land use. These two basic principles can be applied to seriously eroding cropland, pastureland, forest land, and land in other uses to effectively reduce erosion to an allowable level.

It was recognized that the application of soil conservation measures would satisfy several objectives of the sponsors, the Soil Conservation Service, and the public in general. Conservation practices applied to cropland, pastureland and forest land would facilitate the efficient production of agricultural products without depleting the soil resource. The economy would be stimulated. Wildlife would benefit from special wildlife plantings and vegetative measures used to retard erosion. The value of water in watershed streams for fish, wildlife and human use would be increased as a result of reduced sedimentation. In summary, the goal of reduced watershed erosion was set because it would allow watershed residents to fully utilize their soil resource and at the same time improve the quality of the environment.

Flood Prevention

Another goal was flood prevention. Many generations of flood plain landowners have lived in fear of frequent flooding, which at one time or another has damaged crops and land on every acre of flood plain soil. Farm operators have been reluctant to invest capital and labor toward maximum production of agricultural products because of a fear of losing the investment.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

They recognized that tons of precious topsoil were being flushed downstream where it would become an economic problem for their fellow man and a nuisance to fish and wildlife. Through the local Soil and Water Conservation Districts the watershed landowners learned that flood prevention measures in conjunction with watershed protection could reduce their flood problems as well as erosion and sedimentation. Other objectives could be met as well. Watershed streams would flow longer during periods of dry weather and maintain their clarity during periods of runoff. Fish and wildlife would benefit from cleaner water.

The sponsors felt that they should set a goal to reduce the flooding on 6,000 acres of flood plain land immediately adjacent to the Anderson River and its major tributaries. The sponsors realized that watershed landowners would have to make some sacrifices to achieve this flood prevention goal but felt strongly that this goal was attainable and worthwhile.

Fish and Wildlife

A third project goal is to establish and improve wildlife habitat while minimizing habitat losses resulting from project installation. Vegetative watershed protection measures were planned to include species of plants that provide cover and food for a variety of animals and birds. Plantings intended solely for wildlife use were also included. Less intensive use of erosion prone land was recognized as being a benefit to wildlife as well as a soil conservation measure. The sponsors felt that sediment reductions in watershed protection and flood prevention measures would improve the watershed stream fishery. The establishment of lakes and farm ponds would create an extensive lake type fishery and provide a constant water supply for wildlife. Vegetative measures, land use changes and special design features associated with watershed lakes were planned as mitigation for wildlife habitat destroyed by project installation. In summary, the goal of the sponsors and the Service is to create a better environment for the growth and reproduction of fish and wildlife within the watershed.

Recreation

The recreation goal of the U.S. Forest Service is to help meet the demand for a regional park (1) and to provide facilities that would encourage use of our publicly owned forest lands. They feel that a lake of approximately 600 acres and facilities for camping, picnicking, boating and swimming that can accommodate a total of 1,300 people at one time will achieve this goal.

The recreation goal of the Perry County Park and Recreation Board is to provide a district park that would provide for the recreational needs of people living within one-half hours drive of the park. (1) Their desire is to create facilities for camping, nature study, picnicking, boating and swimming that can accommodate a total of 1,200 people at one time.

- () This symbol represents bibliography and text references. These references are found beginning on page 75.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

Municipal and Industrial Water Supply

A fifth project goal is to provide additional water supplies to meet the future needs of the Archabbey at Saint Meinrad and the Town of Birdseye. Consulting engineers for the Saint Meinrad Archabbey have indicated a need for additional water supply based on an expected population increase from 669 people in 1969 to 1,645 people in 2020. The present water supply at the Archabbey will be adequate until 1985. They recommended additional water storage of 100 acre-feet before 1985 to meet the future demands of the Archabbey through the year 2020.

Existing municipal water supply for the Town of Birdseye is considered adequate by their consulting engineers (Midwestern Engineers, Inc., Loogootee, Indiana) for both present needs and future growth. Therefore additional water supplies are necessary to attract industry which in turn will stimulate the town's economy.

PLANNED PROJECT

Land Treatment Measures

Conservation land treatment practices and measures included in this plan will adequately treat 42,582 watershed acres during the project installation period. This land treatment will be voluntarily applied by landowners throughout the entire watershed and will supplement the on-going land treatment program. An estimated 10,737 acres of the total is cropland, 18,002 acres pastureland, 10,500 acres forest land and 3,343 acres land in other uses. The following is a listing with definitions of land treatment measures to be applied respectively to cropland and grassland. (2)

Land Treatment Measures to be Applied to Cropland

1. Contour Farming: Farming sloping cultivated land in such a way that plowing, preparing land, planting, and cultivating are done on the contour. (This includes following established grades of terraces, diversions, or contour strips).
2. Grade Stabilization Structures: A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include structures used in drainage and irrigation systems primarily for water control).
3. Subsurface Drains: A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.
4. Drainage Field Ditches: A graded ditch for collecting excess water within a field.
5. Diversions: A channel with a supporting ridge on the lower side constructed across the slope.
6. Grassed Waterways or Outlets: A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversion, terrace, or other structure.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

7. Terraces: An earth embankment or a ridge and channel constructed across the slope at a suitable spacing designed to prevent soil erosion.
8. Conservation Cropping Systems: Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

Land Treatment Measures to be Applied to Pastureland

1. Pasture and Hayland Management: Proper treatment and use of pasture-land or hayland.
2. Pasture and Hayland Planting: Establishing and reestablishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes Pasture and Hayland Renovation. Does not include Grassed Waterways or Outlets on cropland).
3. Ponds: Water impoundments made by constructing a dam or embankment or by excavating a pit or "dugout".
4. Spring Development: Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

A land treatment program has been developed for private forest lands from a statement of land treatment needs prepared by the Division of Forestry of the Indiana Department of Natural Resources in cooperation with the U.S. Forest Service. The following program is planned for installation on private forest land.

Forest land management plans will be prepared for approximately 101 landowners, involving 5,480 acres, to provide for the proper installation and maintenance of forestry measures on private land.

Tree planting on 430 acres of appropriate open lands in private ownership is necessary to adjust planned use with capability and to reduce runoff and erosion by developing a protective cover and absorbent forest floor of litter and humus.

Hydrologic cultural operations are needed on 4,565 acres to improve the hydrologic conditions of private forest lands by manipulation of stand composition to create conditions favorable for the maximum production and protection of litter, humus, and forest cover. They include thinnings, weedings, improvement, salvage, intermediate harvest and harvest cuttings; supplemental plantings; and protection from overgrazing by domestic livestock.

During development of resource conservation plans, landowners will be encouraged to plan and apply forest management practices that are important in developing or maintaining favorable wildlife habitat conditions.

The existing programs of the U.S. Forest Service on National Forest System land, which include erosion control, reforestation, silvicultural treatments, fire control, and resource development will be continued. The land treatment program for National Forest System lands in this watershed include hydrologic stand improvement and tree planting on 40 acres.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

The proposed forest land treatment program on the State Forest lands includes 25 acres of tree planting and 1,600 acres of hydrologic cultural operations.

Nonstructural Measures

Present flood plain land use is agricultural cropland, forest land and pasture-land. The only structures presently in the flood plain are roads, bridges and utilities. Agricultural use of a flood plain is compatible with a flood plain management plan that minimizes damage and loss of life. Flood protection provided by this plan is not sufficient for more intensive flood plain use.

Flood plain zoning is the most reasonable alternative in preventing more intensive development. The years ahead are expected to bring zoning ordinances of this type. The county governments already have the authority to implement zoning ordinances.

Structural Measures

Structural measures planned include the following: (see appendix B).

1. Forty-six small single purpose floodwater retarding structures.
2. One multiple purpose structure for flood prevention, recreation and industrial water supply. (Structure No. U-1)
3. One multiple purpose structure for flood prevention and recreation. (Structure No. U-10)
4. One multiple purpose structure for flood prevention and municipal water supply. (Structure No. L-24)
5. Approximately 10.5 miles of channel work on the Anderson River main stem, consisting of debris removal and the removal of hazardous trees from the channel flow area without excavation.

Reservoir Type Structures

Foundation conditions under all structures consist of shallow alluvium over bedrock. Alluvial deposits can easily be removed and backfilled with a tight, well compacted soil as necessary, to assure structural safety and minimal inlet and pipe settlement.

The principal spillways on all structures will consist of reinforced concrete inlets with reinforced concrete pipe outlets. Gated outlets are provided for all structures to allow drawdown for reservoir management. Multiple purpose structure Nos. U-1 and U-10 will in addition be provided with multilevel gates.

Emergency spillways on structures Nos. U-1, U-4, U-10, and L-30 will be cut through rock. All other structures will have vegetated earth emergency spillways.

All structures will have two stage inlets storing one inch of flood runoff between the high and low stages. This is the runoff expected from one to two year frequency storms.

Structures U-1 and U-10 are designed to store the runoff expected from a one percent chance storm. Based on long term records, this storm will occur on the average of once in 100 years (100 year storm). Structures U-4, U-17, L-13, L-32, L-40, L-50 and L-51 are designed to store the runoff from a two percent chance storm (50 year storm). All other structures are designed

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

to store the runoff from a four percent chance storm (25 year storm).

All dams will be constructed of earth fill. Rock encountered in the required excavations will be utilized in the dams.

Clearing of the single purpose sites will be limited to that area necessary for construction of the dams and emergency spillways, and the borrow areas. It is estimated that this clearing will amount to 70 acres for the dams and spillways, and 188 acres for borrow. The primary source of borrow will be the reservoir areas. Clearing at site U-1 will amount to 205 acres, and 36 acres at site U-10. Timber having no commercial value will remain uncleared in the upper reaches and in selected laterals and bays of multiple purpose structures No. U-1 and U-10 permanent pools, and those pool areas of all other structures not utilized for borrow purposes. Clearing at site L-24 is estimated at 5 acres, mostly for the dam and spillway. Landowners will be encouraged to remove all timber of commercial value prior to construction.

All structures are designed with an expected life of 100 years. Low stage floodwater inlets for the single purpose floodwater retarding structures are set at the 100-year submerged sediment pool elevations. Approximately 90 percent of the total sediment accumulation will be submerged. The entire submerged sediment storage capacity of the single purpose floodwater retarding structures will be used for water storage purposes initially. Such storage capacity will be displaced gradually with sediment over the 100 year design life of the structures. Readily available borrow material of alluvial deposits exists at all sites.

Primary borrow sources for fill material will be within the land rights areas needed for dams, emergency spillways, and reservoir permanent and flood pools. If these sources should be inadequate, additional borrow sources will be obtained in upland areas or from the downstream flood plain.

Environmental Protective measures, such as desilting basins, temporary seeding, and noise reduction equipment will be specified in each construction contract.

Installation and subsequent operation and maintenance of all structural measures will be in accord with State and local public health and safety regulations. Guidelines from the U.S. Public Health Service will be used in the design of watershed features, to minimize vector problems related to project installation. (3)

Minimum land rights required for the 46 single purpose floodwater retarding reservoirs is 860 acres, of which 173 acres are cropland, 264 acres are pastureland and 423 acres are forest land. Of this, 276 acres acres will be committed to water storage in reservoir sediment pools. Four hundred fifty-three acres will be committed to reservoir retarding pools. The remaining 131 acres will be dams, emergency spillways and emergency spillway flowage easements. Two of these 46 single purpose sites, U-18 and U-38, are on Federal land administered by the U.S. Forest Service. Eight others, U-4, U-8, U-17, U-28, U-29, U-35, L-6, and L-13, are on State land administered by the Division of Forestry, Department of Natural Resources. Of the 46 single purpose

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

reservoirs planned, five appear physically suited or have potential for incidental recreation use. These sites are U-12, U-37, L-30, L-46 and L-55. Very limited private recreation use is expected at those single purpose reservoirs constructed on private land. This can be expected primarily from the adjoining landowners and their guests, and will decline as sediment accumulates in the pool areas. Because the project's planned recreational features satisfy the area's anticipated needs, neither the sponsors or private landowners will provide public access at those reservoirs built on private land. Public access at those 10 sites constructed on public land will be controlled in accord with the appropriate agencies management plan. If access is allowed, sanitary facilities will be provided by the agency in accord with all State and local public health and safety regulations.

Minimum land rights required for structure No. U-1 are 792 acres, of which 77 acres are cropland, 153 acres are pastureland and 562 acres are forest land. Surface area of the permanent water pool is 654 acres. All portions of the dam, reservoir, peripheral access and associated recreational development will be on Hoosier National Forest land and will be open to the public.

Minimum land rights required for structure No. U-10 are 274 acres, of which 134 acres are cropland, 19 acres are pastureland, and 121 acres are forest land. The dam, reservoir, access and associated recreational development will be open to the public. Land rights required for the recreational facilities are 156 acres, of which 3 acres are cropland, 47 acres are pastureland, and 106 acres are forest land. The recreation pool contains 152 acres. Seventy-four acres will be committed to the retarding pool. The remaining 48 acres will be the dam, emergency spillway and emergency spillway flowage easements.

Minimum land rights required for structure No. L-24 are 39 acres, of which 5 acres are cropland, 24 acres are pastureland and 10 acres are forest land. The municipal water storage pool will occupy 21 acres. The retarding pool will be limited by the Anderson River Conservancy District to that which is compatible with the water supply purpose.

Structure U-1 will provide 100 acre-feet of industrial water for the Town of Birdseye. This water will be released through the principal spillway and picked up at a downstream point. Release of this water will be provided through one of the inlet gates. An agreement will be worked out between the Forest Service and the town for water release. The storage provided allows for a monthly use of 3,000,000 gallons, and average daily use of 100,000 gallons and a peak daily use of 300,000. Removal of this water will cause minimal interference with the recreational activities. Complete withdrawal of the 100 acre-feet will lower the pool by less than 2 inches.

The Anderson River Conservancy District is providing 120 acre-feet of water at structure No. L-24 with the intention of selling it to the Saint Meinrad Archabbey. This volume includes storage of 100 acre-feet for future needs at the Archabbey and 20 acre-feet to offset storage and transmission losses. The 100 acre-feet of usable water supply will provide for a monthly use of 3,000,000 gallons and an average daily use of 100,000 gallons. Water supply storage will be released through a gated outlet on the structural principal spillway. Such water will flow down the natural channel to a pick up station from which it will be piped to the treatment plant.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

Disposal of used municipal and industrial water taken from water supply pools will be done according to Indiana State Board of Health regulations. (4)

Four tenths miles of gravel road at structure No. L-55 and 0.2 miles at structure No. U-12, which are inundated by the retarding pools, will be raised. Two tenths miles of road inundated at structure No. L-40 will be realigned. In addition and abandoned farmhouse at site L-55 will be removed.

Six and six tenths miles of roads flooded by structure No. U-1 will be closed. The U.S. Forest Service will consider using such dead end roads as potential access points in the overall management plan which will be developed for the area. Three miles of telephone line presently located in the retarding pool will be removed. Approximately 70 graves from the Blunk Cemetery are located within the proposed permanent and retarding pools of structure No. U-1. Remains from these graves will be moved to some appropriate location above floodwater elevation. Removal of remains and subsequent re-burial will be accomplished according to Indiana law and State Board of Health regulations. This will be accomplished prior to or during construction of the dam.

Several abandoned oil and gas wells are located in or near the pool areas of Structures U-1, U-10, L-74, L-29, L-32, L-40, L-51, L-54, and L-56. These are shallow wells, averaging 500 feet in depth, and most of them are dry. To insure that dry wells are tightly sealed when they are abandoned, Indiana State Law requires that a surety bond be purchased by the owners or persons responsible for the operation of all oil and gas wells in the state. Prior to construction these wells will be appraised as to the necessity of plugging or replugging by officials from the Indiana Department of Natural Resources, Division of Oil and Gas. If surface inspection or well records indicate that the wells are not properly sealed and if a surety bond has been purchased for the well, then the State will take necessary actions to insure proper closure. If there is not a surety bond then the proper closure will need to be considered during the land rights negotiations. All plugging or replugging of wells will be under the supervision of the Division of Oil and Gas.

One and three tenths miles of local roads flooded by structure No. U-10 will be closed. Five abandoned buildings will be removed, and 2 miles of REMC line locations will be changed.

The only known relocations will occur at structure No. U-10, these are one displacement of farm business and two displacements of owner occupied dwellings resulting from the acquisition of land rights for the structure and associated recreational development. Displacement of dwellings will involve nine persons in one instance and two persons in the other. Uniform relocation assistance will be provided to any other persons determined to be eligible during the construction period.

In single purpose structures and multiple purpose structure No. L-24; as mitigation for the losses of wildlife habitat due to flooding, the easement area from the flood pool line to the sediment pool line will be set aside as a wildlife area with appropriate permanent markers. This land would be allowed to undergo natural habitat successional changes from its present condition(s) with the following exceptions:

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

1. If the current use of a definable area is permanent or definite rotation pasture, this practice may continue if stock access to the pool is limited to a specially constructed watering area that is fenced, stone walkway, etc.
2. All wooded areas of one half acre or larger within single purpose structure flood pools will also be fenced when in association with areas of definable pasture use.
3. If hay cutting has been a regular practice, it could continue within the following dates: June 15 to August 31.
4. Areas disturbed by construction activity and other critical erosion areas will be planted to grasses, legumes, shrubs, trees, or a combination of these plants.

Dam and emergency spillway areas of all structures subject to livestock pasturing activities will be fenced to exclude livestock. If any pasturing is to be done in the vicinity of structure L-24, the pool area is also to be fenced to exclude livestock.

These procedures will provide benefits to the vast majority of the numerous wildlife species of this watershed area at some stage of succession. This will be done within the land rights necessary for the structural measures. Multiple purpose structures Nos. U-1 and U-10 will require mitigation in the form of the dedication of wildlife habitat similar to that destroyed, either on existing or replanted lands. Sufficient areas for this purpose are available within the boundaries of these developments. Multiple purpose structures Nos. U-1 and U-10 will be provided with multilevel gates. This will allow for the regulation of water quality in base flow discharges passed through the structures to downstream fishery areas.

All dam and emergency spillway areas and those borrow areas outside of structure permanent pools will be seeded immediately following construction with a mixture of grass, legumes and/or low growing woody species conducive to wildlife use and protection of the structural features. Sufficient soil material will be left in borrow areas outside of structure permanent pools for the establishment of such vegetation. Borrow materials will not be removed from any area which may endanger structure stability or water retention capability. Timber from cleared areas will be disposed of by anchoring in the permanent pool area to provide fishery habitat and stacking on shore for wildlife habitat. All merchantable material may be sold. All other construction activities will be conducted in such a manner as to minimize on site erosion and sediment production. Sediment traps will be constructed below erosive areas to catch construction related sediment.

The Crawford County Historical Society reported the existence of an old grist mill adjacent to Mitchel Creek. This mill would be in the permanent pool of structure No. U-1. An intensive field search has failed to substantiate its existence. The Forest Service is aware of this reported site.

Channels

Planned channel work will consist of the removal of fallen trees, trees in danger of falling, and debris from the flow area of that portion of the

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

Anderson River channel extending from the confluence with Hurricane Creek downstream to the Huffman bridge. An estimated 80 trees and 5 debris blocks will be removed from this 10.5 mile reach. Trees on channel banks and over-bank areas will not be disturbed except where necessary for removal or disposal operations. Debris blocks will be removed with the least possible disturbance to trees and vegetation adjacent to the channel bank and to the earth of the channel bottom and banks. Debris entirely below normal water line will not be removed. Equipment to be used or debris or bar removal will not be allowed in the stream, except floating types. Ingress and egress to each work area will be accomplished without traveling within the channel and without destruction of woody habitat within 20 feet of the channel bank. The work area will be only as large as required and any clearing done will preserve desirable trees and not destroy the canopy. The contractor will be thoroughly briefed concerning work procedures that are necessary to protect the stream and the involved natural resources. Trees and debris removed during construction will be buried or tied down in adjacent areas to the channel.

Bank erosion areas associated with channel obstructions will be stabilized by shaping and ripraping. Flow velocities in the modified channel will be kept within allowable limits commensurate with stability of channel bank and bottom areas. An illustration of the type and extent of planned channel work is shown as Figure 1. Sediment production and disturbance to fish and wildlife habitat will be kept to a minimum during construction through the utilization of hand equipment wherever possible for obstruction removal operations.

Minimum permanent land rights required for the planned channel work are 78 acres, all of which is forest land. Land use in channel work areas will not be significantly affected.

A multiagency field review for planning has determined that fishery and wildlife mitigation measures will not be required for the planned debris and obstruction removal operation.

Public Recreation Facilities

Multiple purpose structure No. U-1 is planned for the purposes of flood prevention, industrial water supply, and public recreation. Surface area of the permanent water pool is 654 acres. Land rights required for structure No. U-1 are 792 acres. All portions of the dam, reservoir, peripheral access and associated recreational development will be on Hoosier National Forest land and will be available for recreation use, and open to the public. No additional land rights for the recreational facilities will be needed.

Recreation facilities to be provided by the U.S. Forest Service include a beach and bathhouse, 20 camping units, 20 picnic units, 1 group picnic unit, 1 boat ramp, a sewage unit, water system, two-way blacktop access roads, nature trails, and parking facilities. Design capacity of the development is for a maximum of 1,300 people at one time. The facilities are located north of the dam and spillway on the west side of the reservoir. The discharge for the waste disposal system will be below the dam.

The Forest Service will be responsible for the design, administration of contracts and all costs associated with the recreational development at structure No. U-1.

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Multiple purpose structure No. U-10 is planned for the purposes of flood prevention and public recreation. The surface area of the permanent water pool is 152 acres. Minimum land rights required for the structure are 274 acres, and for the recreational facilities are 156 acres.

The planned recreational development is north of the reservoir and has a design capacity for a maximum of 1,200 people at a given time. Public access around the reservoir will be assured by purchase of the 430 acres by the Perry County Park and Recreation Board.

Recreation facilities to be provided include a beach and bathhouse, 60 campsites, 1 boat ramp and 18 boat docks, 2 toilet units, 1 shower unit, a sewage system, water system and associated roads and parking areas. Sewage treatment plants will be designed in accordance with State Board of Health regulations. The discharge from the sewage system will be below the dam. A portion of the recreational development is adjacent to the Ferdinand State Forest. This will increase opportunities for public recreation and use.

The two recreational structures in this plan will complement the four existing public recreation structures in the Middle Fork of Anderson River Watershed. The result will be a network of public recreation structures and facilities extending 20 miles in a north-south direction.

The associated recreational facilities are planned to complement the recreational pools at both sites U-1 and U-10, and will facilitate use and management of the areas. In all cases consideration will be given to the physically handicapped in the design of the facilities.

Operation and Maintenance

An establishment period is prescribed to allow time for latent defects and design deficiencies to become apparent. The establishment period for structural works of improvement shall extend three years from the date the structural works of improvement are accepted from the contractor as being completed. The establishment period for vegetative work associated with a structural measure is to terminate when any of the following conditions are met:

- a. Adequate vegetative cover is obtained.
- b. Two growing seasons have elapsed after the initial installation of vegetative work.
- c. The establishment period for the associated structural measure has terminated.

During the establishment period for vegetative measures, the State Conservationist may approve federal cost sharing for any additional work required to obtain an adequate vegetative cover. Approval of the administrator is required for federal cost sharing for other repair or additional work on completed structural works of improvement.

Land treatment measures will be operated and maintained by the owners and operators of the farm under agreement with the local Soil and Water Conservation Districts. Technical assistance will be provided by the Soil Conservation Service. The forest land treatment measures installed on private land will be maintained by the landowners with technical assistance

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furnished by the Indiana Department of Natural Resources, Division of Forestry, in cooperation with the U.S. Forest Service under the going Cooperative Forestry Programs. The U.S. Forest Service and the Indiana Department of Natural Resources, Division of Forestry, will maintain land treatment measures installed on the Hoosier National Forest and the Ferdinand State Forest respectively.

All structures are designed for automatic discharges of floodwater. The Conservancy District will insure the principal spillways are kept free of obstructions so the system will function as designed. Average annual operation and maintenance cost for each of the single purpose structures was set at \$75. The operation of structure No. U-1 and its associated recreational facility will be the responsibility of the Forest Service. An operations agreement will be executed between the Forest Service and the Town of Birdseye for the industrial water supply features. It will include measurement and scheduled release of water. Average annual operation and maintenance cost for the structure and associated industrial water supply feature is \$845.

Funds for the operation and maintenance of the structure and recreational facility will be obtained by user fees where allowed by law. Other funds will come from the Forest Service's regular operating budget. Complete replacement of the recreational facilities is not expected as the Forest Service stresses yearly maintenance and upkeep once such facilities are established. Average annual operation and maintenance cost for the recreational facilities is \$25,620.

The Perry County Park and Recreation Board will be responsible for the operation of structure No. U-10 and the associated recreational facilities. They will also be responsible for implementing such zoning regulations as are necessary to avoid conflict among the various recreational activities. Average annual operation and maintenance costs for the structure and related recreational facilities are \$640 and \$46,772 respectively.

The estimated replacement interval for items needing periodic replacement is as follows: garbage cans, 5 years; road and parking lot surfaces, 10 years; signs, playground equipment, and picnic tables, 17 years; fences, grills, sewage treatment plant and lift station, diving towers, and boat docks, 25 years; and buildings 50 years.

Funds for operation and maintenance of the structure and recreational facilities will be obtained by user fees and through taxation. User fees will not exceed that required to amortize the initial investment and provide for operation and maintenance. These fees will be comparable to those being charged at State-owned facilities of similar quality.

The Anderson River Conservancy District will be responsible for the operation of structure No. L-24, which includes water supply for the Saint Meinrad Archabbey. An agreement will be executed between the District and the Archabbey concerning the release of the water. Water supply storage will be released through a gated outlet on the structure principal spillway. Such water will flow down the natural channel to a pick up station from which it will be piped to the treatment plant. Funds for the operation of the water supply features will be obtained from the sale of water. (5) Average annual operation and maintenance costs for the structure and

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associated with water supply feature are \$250 and \$1,920 respectively.

The operation and maintenance work will consist of such items as:

- a. Repairing damage to structural embankments and spillways.
- b. Mowing grass on embankments and emergency spillways.
- c. Removing trash from the permanent pools.
- d. Removing trash and debris from the channel as required to minimize bank erosion and maintain channel capacity.
- e. Providing operation personnel and equipment for public facilities.
- f. Repairing and replacing facilities.

The mowing operations will be performed in late summer or fall to minimize wildlife cover disturbance. Average annual operation and maintenance cost for the channel is estimated to be \$1,260.

Inspections of the single purpose floodwater retarding reservoirs will be made by representatives of the Conservancy District and the Soil Conservation Service. On structure No. U-1 the inspections will be conducted by the Conservancy District, Soil Conservation Service and U.S. Forest Service, and on structure No. U-10 they will be made by the District, Service, and the Perry County Park and Recreation Board. Inspections of the channel will be made by the District and the Service. Representatives of the Indiana Department of Natural Resources and U.S. Fish and Wildlife Service will also be invited to participate in annual inspections. Land treatment measure inspections will be the responsibility of the landowners. Inspections will be made annually, after unusually severe floods, and after the occurrence of any other unusual conditions that may adversely affect the works of improvement. Authorized persons will have free access for inspections. These joint inspections will continue for at least three years following the installation of each structural measure.

Inspection will note unsightly and damaging erosion, sediment and debris accumulation, and will include such items as the condition and proper functioning of the concrete work, earth fills, principal and emergency spillways, gates and valves, vegetative growth, channel banks and bottoms, and bridge abutments.

Inspection reports indicating maintenance needed will be jointly prepared by the members of the inspection team. A copy will be furnished to each organization or agency participating in the inspection. Follow-up reports will be prepared at regular intervals until all deficiencies noted in the inspection report have been satisfactorily corrected.

Private bridges and facilities of public utilities will be operated, inspected and maintained by the respective owners. All other bridge maintenance will be handled by officials responsible for such maintenance from funds appropriated for that purpose.

Project Costs

Total project installation costs are estimated at \$9,853,553 of which P.L. 566 funds are \$4,125,882 and Other funds are \$5,727,671. Estimated construction cost of the structural measures is \$4,776,545. Of this \$2,534,341 are from P.L. 566 funds and \$2,242,204 are Other funds.

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ENVIRONMENTAL SETTING

Physical Resources

The project is located in Crawford, Dubois, Spencer, and Perry Counties in southcentral Indiana and has an area of 97,174 acres or 152 square miles. Approximately 13 percent of the project is in Crawford County, 19 percent in Dubois County, 25 percent in Spencer County, and 43 percent in Perry County. (6)

The watershed is approximately 25 miles long and averages about 8 miles in width. Anderson River rises in the rolling uplands in the northern portion of the watershed and flows in a general southerly direction to its outlet in the Ohio River at Troy, Indiana. The watershed is a part of the Evansville, Green Subregion of the Ohio Region as classified by the United States Water Resources Council. (7) This subregion includes parts of southern Indiana, central Kentucky, and northcentral Tennessee. This subregion is a transitional zone between the topographically flat to rolling glaciated subregions to the north and the mountainous subregions to the south and east. The water resources within the watershed are similar to those in other watersheds in the westcentral portion of the subregion.

Evansville, Indiana, to the southwest; Terre Haute, Indiana, to the northwest; and Louisville, Kentucky, to the east are the largest urban centers within 100 miles of the watershed. Other metropolitan areas within 200 miles include Indianapolis, Indiana; Cincinnati, Ohio; and Lexington, Kentucky. These centers are easily accessible and provide markets for manufactured products produced in the watershed.

Approximately two-thirds of all watershed soils have very severe erosion potential. An estimated 8,700 acres of these lands are under some form of cultivation. The most serious erosion problems exist in the steep uplands. Four hundred acres of critically eroded land (rill and gully erosion) exist in the upland areas of the watershed. Flood plain scour is a problem on 369 acres of flood plain soils. Potential floodwater damage affects 8,064 acres of land in the flood plain of the Anderson River. Drainage is a problem on approximately 5,650 acres of flood plain soils and 1,150 acres of terrace soils. Approximately 70 percent of these soils are used as cropland.

The central and eastern portions of the watershed lie within the most rugged of Indiana's geomorphic provinces, the Crawford Upland. Topography in these areas consists of great subangular ridges, steep narrow upland valleys, and well developed flood plains. The western portion of the watershed lies within a transition zone between the Crawford Upland and the Wabash Lowland, and is characterized by moderately steep topography with rounded ridges and well developed flood plains. (8) Elevations range from approximately 850 feet mean sea level near the northern boundary to 350 feet at the outlet creating a total relief of 500 feet.

Mean temperatures in the watershed range from 78 degrees Fahrenheit in July to 35.5 degrees in January. The recorded extremes are 12 degrees below zero and 105 degrees above. The average date of the last spring freeze is April 29 and that of the first fall freeze is October 26. The average frost free growing season is 200 days. The mean annual precipitation is 45.2 inches with extremes of 28.8 and 73.9 inches. The more intense rains generally fall during May and June. (9)(10)

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Soils in the watershed are grouped into four associations, the major one being the Gilpin-Berks. Soils in this association are on upland side slopes and are formed in sandstone. They are moderately deep, well drained and strongly sloping to steep. The second major grouping is the Cuba-Haymond association. Soils in this association are deep and well drained and are nearly level. They are formed in medium textured alluvium and are on bottom land areas and low terraces. Soils in the Zanesville-Tilsit association are on upland ridge tops and are deep and moderately well to well drained. They are gently to moderately sloping and are formed in loess over sandstone. Soils in the Markland-McGary association are on terraces near the mouth of the Anderson River and are formed in fine textured lakebed materials. They are deep, well and somewhat poorly drained and are nearly level.

Land unit capabilities of bottomland soils range typically between I and II. (11) Land unit capabilities of terrace soils range typically between II and IV. Land unit capabilities of ridge top soils and steep upland soils range typically from II to VI and VI to VII respectively.

The area is underlain by the Stephensport and the Raccoon Creek bedrock Groups. The Stephensport Group consists of interlayered sandstone, limestone and shale. Sandstone and shale are the predominant rock types. The Raccoon Creek Group is predominantly sandstone with minor beds of limestone, shale and coal. Petroleum and gas are produced in the central part of the watershed, although operations are not extensive. Many wells have been abandoned due to low productivity, and those that are still active are shallow (less than 2,000 feet) and produce oil and gas in relatively small quantities. (12) Oil and gas exploration activities in southern Indiana are on the increase. At least two significant discoveries have been made recently in Spencer County. Past and present production within the watershed will undoubtedly encourage renewed production there. This project will not preempt the recovery of the remaining resources.

Most of Perry County's recoverable reserves of coal lie within the watershed. The U.S.D.I. Bureau of Mines reports that these reserves amount to over 10.1 million tons of coal obtainable by underground mining. Coal is also present in the Crawford, Spencer, and Dubois County portions of the watershed. Sandstone is quarried locally for domestic building purposes, but the low quality of the stone limits its potential as a marketable product. (6)

Ground water supplies are limited for use throughout all but the lower portion of the watershed. These supplies must generally be supplemented by surface water. Aquifers present within most of the watershed are limited to relatively dense sandstone and minor limestones which are both slow to moderately permeable and do not lend themselves to high capacity well development. Thick deposits of Ohio River sediments bordering the southern extremity of the watershed contain vast quantities of easily recoverable ground water. (13)

Present land use in the watershed and the flood plain area is estimated as follows:

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Land Use	Acres		Percent	
	Watershed	Flood Plain	Watershed	Flood Plain
Cropland	26,241	6,372	27	79
Pastureland	22,901	351	24	4
Forest Land	38,622	1,036	40	13
Other Land	9,410	305	9	4
TOTAL	97,174	8,064	100	100

Flood plain land with adequate drainage is predominately used for continuous row cropping (corn and soybeans) and for row crop-small grain (wheat) rotations. Those flood plain areas with drainage problems are mainly in grass (bluegrass, fescue, and orchardgrass) and are managed as pastureland. Small tracts of forest land exist within the flood plain in areas where drainage problems exist or where access by farm machinery is difficult.

Upland cropland is limited to hillside benches formed by weathering and erosion of shale formations, the flatter ridgetops, and to gently sloping hillsides. Crop rotations are typically one season of corn followed by a season of wheat followed by three years of pasture. Upland acreages utilized for continuous pasture are predominantly cleared grassed areas on moderate to steep slopes that cannot be economically cropped because of serious soil erosion hazards. Approximately 8,300 acres of land, mostly in the upland areas, are used periodically beyond their capability and become subject to severe erosion losses. Approximately 400 acres of upland soils in scattered small tracts have been used continuously beyond their capability resulting in critical rill and gully erosion. In summary, the most common improper uses of the erosion prone upland soils are the frequent cultivation of row crops and small grains and the practice of over grazing of cattle on pastureland.

Most of the forest land in the watershed is found on the steep upland slopes. Much of the forest land and some areas of idle land are slowly undergoing a successional change in plant species. Most of these areas are in sub-climax stage where oak-hickory are the dominant species. Left undisturbed, beech-maple climax forests will ultimately emerge.

Percent of forest land area in the watershed by Timber Type. (14)

<u>Timber Type</u>	<u>Percent</u>
Loblolly - Shortleaf pine	2
Oak - Pine	3
Oak - Hickory	71
Oak - Gum - Cypress	< 1
Elm - Ash - Cottonwood	6
Maple - Beech - Birch	18

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Percent of forest land in the watershed by Stand Size and Timber Type. (14)

Stand Size Class	Loblolly Shortleaf Pine	Oak Pine	Oak Hick- ory	Oak Gum Cy- press	Elm Ash Cotton- wood	Maple Beech Birch
Saw Timber Stand	51	14	16	49	79	68
Pole Timber Stand	24	45	36	25	9	18
Seedling and Sapling Stand	25	41	48	26	12	10
Non-stocking	<1	-	-	-	-	4
						1

All streams within the watershed can be classified as unmodified, well defined natural channels or streams except for about 2 miles, a 1 mile section on the main channel in reach 6 and a 1 mile section on Hurricane Creek in reach 21. (6) These sections have been modified previously by channel excavation. (See project map.)

There are approximately 116 miles of perennial streams in the watershed (streams which flow at all times except during extreme drought). Perennial streams include the main branch of the Anderson River and the middle and lower reaches of all named major tributaries. Approximately 206 miles of intermittent streams (streams with continuous flow through some seasons of the year but little or no flow through other seasons) exist with the watershed. (6) Intermittent streams include the upper reaches of named tributaries to Anderson River and the major tributaries to these streams which flow across definable flood plains. Many ephemeral streams (streams which flow only during periods of surface runoff) exist in the well defined steep narrow drainageways tributary to intermittent streams. Ephemeral streams lack a definable flood plain and normally flow on bedrock. The great density of ephemeral streams precludes accurate measurement of their total length.

The main branch of the Anderson River begins at the rugged extreme northern portion of the watershed as a narrow rocky channel flowing in a wooded, steep valley. Two and one-half miles downstream, a flood plain widens to nearly a quarter of a mile near the confluence with Mitchel Creek. Proceeding downstream, the flood plain has a fairly constant width but the channel becomes wider and deeper with increasing flow from numerous tributaries. The stream meanders across the flood plain repeatedly, occasionally contacting the valley walls exposing sections of massive sandstone bedrock. At the junction with Sigler Creek the flood plain is nearly one-half mile wide between steep wooded uplands. The width remains constant through the mid reaches of the watershed. The channel gradually increases to approximately 25 feet in width and to approximately 10 feet in depth in the vicinity of Saint Meinrad. Steep sided, tree-lined banks with minor cycles of riffle and pool development characterize the middle and lower reaches. Approximately two miles below Saint Meinrad the flood plain narrows appreciably. In the lower reaches the river becomes more sluggish and is bordered by increasing numbers of woodlots. Below the confluence of the Middle Fork, Anderson River averages over 100 feet in width and 15 feet in depth. The Anderson River enters the Ohio River about one-half mile west of Troy, Indiana.

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Water for the Archabbey at Saint Meinrad is provided from two small reservoirs with surface areas of approximately five acres each. A State owned 40 acre lake in the Ferdinand State Forest provides some public recreation and a dependable source of water to the fish hatchery located immediately downstream.

A small private recreation development adjoins the Spencer County Memorial Forest lake in the southwestern part of the watershed. Facilities provide for picnicking, camping and fishing.

Results of a surface water sampling and testing program conducted by U.S. Geological Survey indicate a generally good quality of water within the basin. A few water quality problems, in certain isolated areas, were identified. These are related to abandoned strip mining operations, agricultural chemical runoff, and ineffective septic systems in isolated areas.

Present and Projected Populations

Census data for 1960 and 1970 shows that the four counties encompassing the watershed are experiencing a slower rate of population growth than the State average. The following table offers a comparison of each individual county to the State total. Growth percentages shown for Dubois, Perry and Spencer Counties are influenced primarily by population increases outside the watershed area.

<u>Area</u>	<u>Population</u>		<u>Change</u>	
	<u>1960</u>	<u>1970</u>	<u>Number</u>	<u>Percent</u>
Crawford County	8,379	8,033	-346	-4.1
Dubois County	27,463	30,934	3,471	12.6
Perry County	17,232	19,075	1,843	10.7
Spencer County	16,074	17,134	1,060	6.6
Indiana	4,662,498	5,193,669	531,201	11.4

(19)

Median age of the population is 32.1 years for Crawford County, 25.0 for Dubois County, 27.5 for Perry County, 28.8 for Spencer County, and 27.2 for the State of Indiana. (15)

Economic Resources

Watershed land is predominately in private ownership with the exception of 10,290 acres of public forest land holdings. Approximately 6,470 acres are located within the Ferdinand State Forest which is administered by the Indiana Department of Natural Resources, Division of Forestry. The Hoosier National Forest Proclamation Boundary includes approximately 12,300 acres of watershed land of which 3,820 acres are currently in public ownership. The National Forest System lands are located in two areas of the northeast portion of the watershed. One is in the area of structure No. U-1 and, although the ownership boundary is irregular, the tracts of federal land are connected forming almost continuous ownership around the structure site. The other area of approximately 1,000 acres lies south of structure site No. U-1. There is very little scattered ownership in the watershed portion of the National Forest. These areas are administered by the U.S. Forest Service, which is currently involved in an active land acquisition program.

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Eight hundred farms are located wholly or partially within the watershed and are primarily of the family farm type. The average farm is 120 acres in size and average about \$36,000 in value. Upland cropland is valued at \$150 to \$450 per acre, flood plain cropland at \$450 to \$900 per acre and forest land at \$75 to \$300 per acre.

The watershed is primarily an agricultural area with livestock, livestock products and cash grain comprising the major agricultural enterprises. Major crops grown in the flood plain are corn and soybeans with average yields over the past several years of 60 bushels per acre for corn and 20 bushels for soybeans. Crops grown on upland areas are about evenly divided between row crops, small grain and meadow. Forest land areas are moderately to well stocked with mixed central hardwood types predominating.

Towns and villages within or on the watershed boundary are Birdseye (population 366), Saint Meinrad (population 700), Troy (population 537), and New Boston (population 50). These local communities together with the larger towns of Jasper, 15 miles to the north of the watershed; Tell City, 4 miles to the south; Evansville, 48 miles to the west; and Louisville, Kentucky, 64 miles to the east, serve as principal center of economic, social and cultural activity for watershed residents. Present population within a 25 mile radius of the watershed is estimated at 80,000 and over one-half million people live within a 50 mile radius.

Markets for watershed agricultural products are generally adequate and are supplied through local grain elevators, livestock auctions and slaughter facilities, and regional outlets outside the watershed. Local markets for quality sawlogs, veneer logs, stave material, pallet material and pulpwood are good.

U.S. Road No. 460 and State Road No. 62 cross the area in an east-west direction. These roads are located in the northcentral portion of the watershed. State Road No. 145 passes through the northeastern portion of the area in a north-south direction. State Road No. 545 runs along the watershed's western boundary. State Road No. 64 follows the northern boundary, and State Road No. 66 crosses near the watershed's outlet into the Ohio River. These highways together with a well developed system of county roads provide easy access to all parts of the watershed. Southern Railway branch lines cross the northern and southern parts of the watershed. They generally run in an east-west direction.

Interstate Highway No. 64, currently under construction, will cross through the middle of the watershed. It will provide direct routes to Evansville, Indiana, and Louisville, Kentucky. A new bridge over the Ohio River at Cannelton has also facilitated traffic flow.

Many watershed farms are low income producing units with an estimated 60 percent having gross sales of less than \$5,000 per year. The average market value per farm of all agricultural products sold in 1969 was \$5,685 in Crawford County, \$23,578 in Dubois County, \$6,152 in Perry County, \$11,485 in Spencer County and \$13,797 for the State of Indiana. Seventy percent of watershed farmers have off-farm income. (16)

Farm products sales are derived approximately 80 percent from livestock and

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livestock products and 20 percent from crops. Forest products account for but one percent of farm product sales.

Characteristics of farm operators in the four watershed counties and the State of Indiana for the year 1969 are shown in the following table. (16)

<u>Characteristics</u>	Crawford County	Dubois County	Perry County	Spencer County	State of Indiana
No. Operators	543	1,180	583	1,136	-
No. Full Owners	482	891	470	736	-
No. Part Owners	52	213	83	301	-
No. Tenants	9	75	30	99	-
Percent Tenancy	1.6	6.4	5.1	8.7	12.1
Average Age	52.0	48.0	50.7	50.2	49.8

Per capita and median family incomes for the four counties are lower than the State average. Except for Dubois County, all the counties have a higher percentage of families with income below the poverty level than the State average. The following table reflects the income and poverty status of watershed counties in comparison to the State of Indiana.

<u>Area</u>	Per Capita Income (Dollars)	Median Family Income (Dollars)	Percent of Families With Income Below Poverty Level
Crawford County	2,220	6,655	18.1
Dubois County	2,641	9,011	6.7
Perry County	2,346	7,989	13.2
Spencer County	2,303	7,785	15.2
Indiana	3,093	9,970	7.4

(17)

A high percentage of the watershed work force is employed outside of the watershed area. Manufacturing and retail trade enterprises located in nearby cities offer the greatest employment opportunities. Agricultural and construction jobs rank third and fourth as major areas of employment. Major types of employment for the four counties are manufacturing - 41 percent, retail trade - 13 percent, agriculture - 9 percent, construction - 8 percent, and all other - 29 percent. (17)

Annual unemployment averages for 1970 as determined by the Indiana Employment Security Division were 13.2 percent in Crawford County, 3.4 percent in Dubois County, and 5.6 percent in Perry County. (18) Information was not available on employment rates for Spencer County. Indiana unemployment rate for 1970 was 4.8 percent and was 4.9 percent for the United States. (19)

The entire watershed area is located within either the Lincoln Hills or the Four Rivers Resource Conservation and Development Project areas. The Crawford County portion of the watershed lies within a designated economic development area under the Economic Development Act.

Plant and Animal Resources

The Anderson River provides a significant sport fishery from its confluence with the Ohio River upstream for approximately seven miles. Upstream reaches

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serve primarily as spawning and nursery areas. The Indiana Division of Fish and Wildlife has developed a public fishing access site with a boat launching ramp at the State Road 545 bridge across Anderson River about 1.5 miles upstream of its outlet in the Ohio River. Use by fishermen is evident at this and most other points of easy access along the lower portion of the main stem.

Fish sampling studies were conducted by the Indiana Department of Natural Resources, Division of Fish and Wildlife, to determine species composition and distribution in the Anderson River. Based on weight, game fish species were found to compose approximately twenty-five percent of the total fishing in the lower reaches. Game species present in these areas included channel catfish, largemouth bass, spotted bass, freshwater drum, white crappies, sunfishes and bullheads. (20)

In addition, many important species of forage fish were found throughout the watershed stream system. Reproduction of forage fishes (bluntnose minnow, common shiner, creekchub, etc.) contribute to the food supply required by the game fishes in Anderson River as well as the Ohio River. Water quality within watershed streams is not a limiting factor to species growth or reproduction.

Other fishery resources in the watershed include a 40 acre lake within the Ferdinand State Forest in the westcentral portion of the watershed, two small water supply reservoirs for the Saint Meinrad Archabbey in the central portion, a small lake in the Spencer County Memorial Forest in the southwest portion, and a number of scattered small farm ponds. The lake within the State Forest has a public access and supports moderate populations of bluegill, crappie, bass bullheads, and carp. All other impoundments are private and are stocked primarily with bass and bluegill.

Wildlife numbers and species throughout the watershed are influenced by the high percentage of forest lands and mixture of different habitat types such as cropland, grassland, and forest land. Wildlife populations are considered good. Deep forest dwelling species include gray squirrel, gray fox, a number of small mammals such as chipmunks, mice and moles, and a variety of woodpeckers. Principal edge and small woodlot dwelling species include the cottontail rabbit, fox squirrel, woodchuck, bobwhite quail, and a large variety of raptors and songbirds. Whitetail deer, red fox, and raccoon are found associated with both edge and small woodlot habitat and with large tracts of deep forest habitat.

Squirrels and rabbits are the most abundant game animals and receive two-thirds of all hunting pressure. Quail hunting also occurs and ranks third in popularity. Both fox and raccoon are numerous and afford many hours of hunting and chasing. The deer population in the watershed is below the natural carrying capacity of the available habitat mainly as a result of heavy poaching pressure. (21) Muskrat is the most popular quarry of trappers because of their relative abundance near farm ponds and streams. Mink are sometimes taken but are not very plentiful in this area.

Public hunting is limited to access points along Anderson River, land within the Hoosier National Forest, and Ferdinand State Forest lands.

Waterfowl in the area are primarily limited to wood ducks. The lower main stem of Anderson River and some upstream reaches serve as important nesting and brooding grounds.

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No rare and endangered species are known to exist within the Anderson River Watershed.

Recreational Resources

Existing public recreational resources in the watershed include the previously mentioned 40 acre lake in the Ferdinand State Forest and the Anderson River access site at State Road 545 bridge. A public recreation facility adjoins the State Forest lake and is operated and maintained by the Indiana Department of Natural Resources, Division of Forestry. Facilities are provided at this location for camping, swimming, picnicking, hiking, boating, fishing and hunting. The design capacity of the recreational facility is 600 people. This facility is fully utilized during the 14-week summer recreation season, and estimates are that 25,000 to 30,000 people use the facility each year. Other public recreational resources in the watershed include State and National Forest lands which are available for hiking, nature observation and hunting. The U.S. Forest Service is actively buying land for this purpose.

A small private recreation development adjoins the Spencer County Memorial Forest lake in the southwestern part of the watershed. Facilities provide for picnicking, camping and fishing. Approximately 1,000 recreation visits have been recorded annually.

Another P.L. 566 project on the adjacent Middle Fork of Anderson River Watershed to the east is providing recreational opportunities at four of the six completed structures. These 4 structures are multiple purpose for flood prevention and recreation and provide 485 acres of surface water as a base for water-oriented recreation. Land area adjacent to the water is being developed by the U.S. Forest Service for various uses such as picnicking, camping, and hiking. The water areas are being used for boating (no gas motors), fishing, and swimming.

The wooded uplands of the watershed are suited for recreational development because of their land forms and vegetation. The uplands generally lack areas of permanent water for outdoor water based recreation but do have numerous sites for lake development. Upland soils with slopes less than 12 percent have moderate limitations for recreational facility development, and those soils with slopes greater than 12 percent have severe limitations. Flood plain areas lack the natural beauty of the uplands and are generally best suited for long term agricultural use. Flood plain soils have severe limitations for developing permanent recreation facilities because of periodic flooding. Water quality of streams within the watershed presents no limitation to the development of water based recreation facilities.

Archeological, Historical and Unique Scenic Resources

The Glenn A. Black Laboratory of Archeology, Bloomington, Indiana, provided information concerning known sites of archeological interest within the watershed. Such sites are limited to scattered areas where chipped stone remnants identify the locations of past Indian activity. Natural rock shelters once used by Indians can also be observed along sandstone escarpments in the northern and western portions of the watershed. (22)

All information has been forwarded to the State Historic Preservation Officer.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

His letter of concurrence is included in the Consultation section.

The National Register of Historic Places lists no features of historical significance within the watershed. The Archabbey at Saint Meinrad is eligible for nomination to the Register. The only watershed structures near this site is L-59, to the northwest. This structure will have no direct effect, and will not be visible from the Archabbey.

County historical societies report several pioneer cemeteries scattered throughout the area and the possible remains of a grist mill adjacent Mitchel Creek in the northern part of the watershed. An intensive field investigation failed to locate any remains of this grist mill.

The requirements of Executive Order 11593 pursuant to the Soil Conservation Service responsibilities have been fulfilled.

In accordance with PL-86-523 as amended by PL-93-291, any evidence of a cultural site uncovered during construction will be reported to the Indiana Historical Society and the State Historic Preservation Officer to make arrangements for the investigation and salvage of all artifacts possible.

Soil, Water and Plant Management Status

Recent land use statistics for the watershed are shown in the table below. Land in farms is on the decline, as is the amount of land in intensive agricultural use. Expansion of Hoosier National Forest represents a significant factor in the decline of land in farms for Crawford and Perry Counties. County and total land acreage difference between 1964 and 1969 reflect the acreage of lakes and farm ponds constructed in this period.

<u>Item</u>	<u>Year</u>	<u>Crawford County</u>	<u>Dubois County</u>	<u>Perry County</u>	<u>Spencer County</u>	<u>Total</u>
Approximate land Area - Acres	1964	199,685	277,125	245,765	253,445	976,020
	1969	199,680	276,992	245,760	253,440	975,872
Land in farms - Acres	1964	107,075	219,255	137,745	200,755	664,830
	1969	85,660	214,849	99,282	203,065	602,856
Percent in farms	1964	53.6	79.1	56.0	79.2	68.1
	1969	42.9	77.6	40.4	80.1	61.8
Total cropland - Acres	1964	44,727	142,032	62,466	143,509	392,734
	1969	39,933	139,780	50,982	149,497	380,192
Harvested Cropland - Acres	1964	17,705	87,543	31,651	100,775	237,674
	1969	12,215	82,563	24,466	97,262	216,506
Cropland used only for pasture or grazing - acres	1964	15,000	27,132	14,464	20,443	77,039
	1969	15,838	30,114	14,461	27,600	88,013
All other crop- land - acres	1964	12,022	27,357	16,351	22,291	78,021
	1969	11,880	27,103	12,055	24,635	75,673

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<u>Item</u>	<u>Year</u>	<u>Crawford County</u>	<u>Dubois County</u>	<u>Perry County</u>	<u>Spencer County</u>	<u>Total</u>
Woodland including						
Woodland pasture -	1964	44,803	53,352	54,334	28,010	180,499
Acres	1969	30,081	47,847	36,707	31,757	146,392
All other land -	1964	17,534	23,860	20,942	29,225	91,561
Acres	1969	15,646	27,222	11,593	21,811	76,272
						(16)

Labor and capital resources are generally underinvested in the crop production process on watershed flood plain soils, and in pasture and forestry enterprises throughout the area. Intensive agricultural use is practiced on approximately 8,700 acres of marginal upland which has severe erosion hazards.

The importance of land treatment is recognized by the Soil and Water Conservation Districts involved within the watershed area and by the several public land administering agencies with watershed holdings.

Primary emphasis of the Soil and Water Conservation Districts has been to assist in the development and implementation of complete conservation plans on private land. Plans emphasize tree planting and management, pond construction, and installation of sediment and erosion control measures such as grade stabilization structures, diversions and grassed waterways. Conservation measures receiving emphasis on publicly administered land include tree planting, woodland grazing control and fire control.

To date, \$2,040,206 has been spent in the watershed for installation of approximately 46 percent (based on cost of installation) of the needed land treatment measures. Fifty-seven percent of the watershed is covered by cooperative agreement with the local Soil and Water Conservation District. Approximately 26.4 percent (25,648 acres) of the watershed area is adequately treated. Of this 26.4 percent, 2.7 percent is cropland, 7.8 percent is pastureland, 14.6 percent is forest land, 0.3 percent is wildlife and recreation land and 1.0 percent land in other uses.

Three hundred and eighty-three watershed landowners are district cooperators, 293 of which have developed basic conservation plans covering approximately 42,400 acres. Soil surveys have been made on approximately 87,700 acres of watershed land (90 percent of the total area). (6) The following table reflects the status of land treatment in the watershed at the time of work plan preparation.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

Measure	Unit	Applied To Date	Total Cost (Dollars)
<u>LAND TREATMENT</u>			
Soil Conservation Service			
Conservation Cropping System	Acres	5,205	9,733
Contour Farming	Acres	1,078	2,207
Crop Residue Management	Acres	4,578	7,142
Critical Area Planting	Acres	3	300
Diversions	Feet	68,458	21,222
Drainage Field Ditch	Feet	11,500	2,070
Drainage Main or Lateral	Feet	92,223	57,178
Drains	Feet	839,769	520,658
Grade Stabilization Structure	Number	56	35,000
Grassed Waterways	Acres	168	58,800
Minimum Tillage	Acres	413	1,420
Open Channel	Feet	34,537	38,681
Pasture Management	Acres	2,269	68,070
Pasture Planting	Acres	7,691	615,280
Pond	Number	351	351,000
Spring Development	Number	9	5,512
Stripcropping	Acres	40	150
Terraces	Feet	23,684	5,921
Wildlife Habitat Management	Acres	255	9,562
Forest Service			
Fire Control	Acres	42,430	42,400
Hydrologic Cultural Operations	Acres	2,478	26,900
Management Plans	Number	112	6,200
	Acres	5,913	
Tree Planting	Acres	2,278	120,900
Woodland Grazing Control	Acres	4,032	33,900
	Mi. of Fence	32	
TOTAL	:	:	2,040,206

Projects of Other Agencies

Patoka Lake, a reservoir of nearly 9,000 acres (seasonal pool) for flood control, water quality, water supply and recreation, is currently under construction by the U.S. Army Corps of Engineers to the north of Anderson River Watershed. The dam site is located near Ellsworth, Indiana, on the main stem of the Patoka River. The seasonal (water supply) pool of the lake will extend upstream from the dam to a point approximately 3 miles west of Indiana State Road 37. At several points the permanent pool will be within two to three miles of the northern watershed boundary. Approximately 6,000 acres of land will be acquired specifically for outdoor recreational use. Certain areas of the reservoir will be zoned for power boating and others for no-wake boating. Recreation features of this project will satisfy needs for one of the two recreation parks outlined in the Indiana Outdoor Recreation Plan.

The U.S Forest Service, acting in concert with the Bureau of Outdoor Recreation, is utilizing Land and Water Conservation Fund monies to acquire additional lands for recreation in the Anderson River Watershed. These lands will be complementary to the recreational facilities planned in this project.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Inherently low fertility and very severe erosion potential are problems characteristic of approximately two-thirds of watershed soils. An estimated 8,700 acres of these lands are under cultivation, with one year out of three devoted to row crop production. Labor and capital resources committed to the crop production on these lands are producing marginal returns. Such lands should be voluntarily converted to grassland or forest land uses to provide adequate erosion protection.

Much of the remaining land under cultivation in the watershed has moderate to severe drainage problems or erosion hazards. Ability of these soils to produce efficiently both today and in the future requires an expanded voluntary effort by landowners in applying needed land treatment practices and improvements.

Additional on-farm water supplies are needed within the watershed to complement existing pasture enterprises and to encourage needed land use conversions from marginal cropland to pasture. Critically eroding areas are in need of treatment with vegetative species for stabilization.

Forest land areas, which constitute 40 percent of the watershed, are in generally fair hydrologic condition. Improvement in hydrologic condition and associated productive capability is dependent, however, upon continued protection of such areas from fire and grazing and upon a further intensification of management.

Overall economic capabilities of landowners and operators in the watershed presents a moderate limitation to application of needed land treatment on privately owned lands. Financial assistance beyond usual sources of cost share assistance now available to the area under RC&D will be needed for installation of some of the more capital demanding land treatment practices and measures. A continuing education and information program spearheaded by the county Soil and Water Conservation Districts is needed to effectively reach and motivate that segment of watershed landowners and operators who derive the majority of their income from non-farm sources.

Floodwater Damage

Damages to crops, pastures, other agricultural properties, roads and bridges are the principal floodwater problems in the watershed. These damages are associated with storms which generally occur two to three times per year. Twenty-nine percent of these flood-producing storms occur during May, June, and July when crops are most susceptible to damage. The probability of floods occurring in any given month is shown in the following table. (6)

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

<u>Month</u>	<u>Chance of Occurrence (percent)</u>
January	12
February	13
March	15
April	14
May	11
June	10
July	8
August	3
September	2
October	2
November	4
December	6

The agricultural flood plain covers 8,064 acres and includes 6,372 acres of cropland valued at an estimated \$4,300,000. The following table indicates acres flooded by project evaluation reaches (see project map) for the 1, 10, and 100 year floods (floods that have a statistical probability of occurring once in 1, 10 and 100 years respectively). This data is based on headwater flooding only and does not include backwater effects from the Ohio River.

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Evaluation Reach	Annual Flood Without Project	10-Year Flood Without Project	100-Year Flood Without Project
1	698	798	846
2	167	283	337
2A	347	394	426
3	236	315	364
4	207	268	422
5	485	654	679
6	374	435	473
7	1,019	1,274	1,340
8	151	184	192
9	258	294	307
10	67	73	77
11	105	127	135
12	77	107	116
13	61	112	149
14	30	60	70
15	20	30	32
16	78	91	103
18	96	113	120
19	45	54	59
20	311	348	368
21	89	125	132
22	198	206	213
23	72	118	145
24	71	83	91
25	72	83	86
26	36	42	45
27	52	61	65
28	103	162	176
29	10	18	31
30	39	44	45
40	112	200	234
41	82	98	111
42	61	69	75
TOTAL	5,829	7,323	8,064

Considerable flooding in reaches 40, 41 and 42 is caused by backwater from Anderson River and/or the Ohio River. Damages in reaches 1, 2 and 2A are resultant from a combination of Anderson River headwater and Ohio River backwater. Floodwater damages in all other reaches are direct result of headwater floods of the Anderson River or its several tributaries. (See project map - Appendix B)

Damage to crop and pasture from such flooding is extensive. Farmers have reported crop losses ranging from 20 percent up to 100 percent from the most severe floods. Delayed planting and/or replanting associated with the flood problem causes increased crop production costs and decreased crop yields. Sediment deposition during flooding causes damage to plants by coating leaves with silt and clay particles. Capital and labor resources are underinvested in the crop production process because of the risk of reduced yields due to flood damages.

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Based on the monthly probability of flood occurrence, crop and pasture damages for future conditions without project are estimated at \$207,220 for the 100 year frequency flood event (8,064 acres inundated), \$173,784 for the 10 year frequency flood event (7,323 acres inundated) and \$117,311 for the 1 year frequency flood event (5,829 acres inundated).

In addition to crop and pasture damages, flooding results in underuse of flood plain land, and in excessive use of sloping upland. Some cropland areas in the flood plain have grown back into timber or are being used as pasture because of flooding.

Time and expense are involved in removing debris from flood plain areas, repairing fences, farm roads and tile outlets, removing sediment from drainage ditches and controlling weed infestations carried in by floodwaters.

Interruption of travel, mail and school bus service, and delay and inconvenience in feeding livestock constitute serious problems during flood periods. Flood damage is extensive to county roads and bridges in the watershed. Roads and bridge approaches are voided by the erosive action of floodwaters. Bridge foundations are undercut by floodwaters and some cases are rendered unsafe for vehicular use. Road and bridge repairs are expensive and often travel is interrupted until such repairs are made.

Erosion Damage

Sheet erosion is active throughout the watershed's rolling upland areas and serves as the primary sediment source. Approximately 90 percent of watershed soils have erosion hazards. Twenty percent of these soils are in cropland. Soil losses due to sheet erosion on flood plain cropland range between one and two tons per acre per year. Sheet erosion losses on flood plain pasture-land and forest land are typically below one ton per acre per year. The nearly level flood plain soils do not possess the physical potential for excessive sheet erosion losses. Soil losses on cropland in the uplands range typically between 3 and 10 tons per acre per year and are generally in excess of the allowable loss of 3 tons per acre per year. An allowable soil loss is the soil loss in tons per acre per year which can be allowed on a specific soil and still permit a high level of crop production to be sustained economically and indefinitely. (23) Sheet erosion rates can run as high as 26 tons per acre per year on very steep upland soils that are plowed and planted to continuous row crops. Erosion rates on upland pastureland and grazed forest land range typically between three and seven tons per acre per year and are generally at or above the allowable limit. Erosion rates on undisturbed forest land and on land in State and National forests are generally at or below the allowable limit of three tons per acre per year but can run as high as eight tons per acre per year on extremely steep slopes. Erosion rates on all land adequately treated by conservation practices (approximately 25,648 acres) and used according to its capability are at or below the allowable limits.

Gully erosion is prevalent in isolated areas throughout the watershed. Areas affected are the more steeply rolling uplands. Affected areas are primarily idle land, cropland or pasture. Steep gradients with high flow velocities, marginal to inadequate vegetative cover and infertile soils are prime contributors to the gully erosion problem. Gully erosion rates range between 20 and 35 tons of soil loss per acre annually.

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Approximately 400 acres of critically eroded land exist within the watershed. This figure includes areas of gully erosion, rill erosion and severe sheet erosion which typically occur on small steep upland plots that range in size from 1 to 15 acres.

Flood plain scour is a significant problem within the watershed. Erosion occurs through the scouring effects of floodwaters on nearly level flood plain soils. Such scouring removes fertile topsoil leaving less fertile, wet depressional areas exposed. Crop production potential on such areas is reduced. An estimated 369 acres of watershed flood plain soils are seriously affected by this problem. Average annual damages from flood plain scour are estimated at \$5,241.

Stream bank erosion occurs throughout the watershed. In part, this condition is caused by large trees or debris blocks within main channel areas. Stream flow in such areas is deflected by these obstructions or made more turbulent. Localized erosion of channel banks results. Stream bank erosion is not a serious watershed problem.

Total gross erosion on the watershed averages 553,892 tons per year. Overall watershed erosion is approximately 98 percent attributable to sheet erosion, 1.5 percent to gully erosion and 0.5 percent to stream bank erosion and flood plain scour. Erosion damages significant to the formulation and evaluation of a structural program were limited to those associated with flood plain scour.

Sediment Damage

Sediment damage occurs predominately in the upper reaches of watershed tributary streams. Channels in these areas fill with gravel and sand at major gradient breaks. Farm operators have had to remove sediment accumulations from these channels to prevent excessive flooding and rising ground water levels on adjoining lands.

Some sand and silt particles are deposited in the larger drainageways and cause channel flow restrictions at scattered points. This problem is characteristic of the normal cyclical pattern of natural streams. Sediment accumulations in existing watershed lakes are not excessive because of the high percentage of forest cover within their respective drainage areas.

Of the 553,892 tons per year of gross erosion an estimated 40,000 tons are flushed from the watershed into the Ohio River annually.

Drainage Problems

Approximately 6,800 acres of watershed soils are imperfectly drained which limits agricultural use. Over 70 percent of these soils are currently used as cropland. Soils affected include the Bartle and McGary located in terrace positions in the watershed and the Stendal and Wakeland located in flood plain areas. These soils are suitable for crop production without drainage but yields are generally depressed, crop quality reduced and production costs increased. The remaining 30 percent of the imperfectly drained soils are in pastureland, forest land, and recreation land. The imperfectly drained soils are best suited for pastureland, but with drainage measures applied will sustain high crop yields. Outlets for tile and surface drainage of these soils

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

are generally adequate throughout the watershed. Needed drainage measures have been installed on 20 percent of the affected area. High initial cost and the threat of frequent flooding have limited installation of these drainage measures.

Municipal and Industrial Water Problems

Ground water supplies are marginal for domestic use throughout all but the extreme lower portion of the watershed. Ground water resources generally must be supplemented from other water supply sources for large farm operations and for municipal and industrial use.

The existing water supply for the Saint Meinrad Archabbey is considered adequate in quality and quantity to the year 1985. Consulting engineers for the Saint Meinrad Archabbey have indicated a need for additional water supply based on an expected population increase from 669 people in 1969 to an estimated 1,645 people in 2020.

Existing municipal water supply for the Town of Birdseye is considered adequate by their consulting engineers (Midwestern Engineers, Inc., Loogootee, Indiana) for both present and future domestic needs. Water is not considered adequate, however, for future industrial growth.

Recreation Problems

Population growth, rising standards of living, and increased amounts of time for leisure activities are creating increased demands for outdoor, water based recreation activities in the watershed and surrounding areas. The present population within a 25 mile radius of the watershed is estimated at 80,000 and over one half million people live within a 50 mile radius.

The watershed has an abundance of scenic beauty, wooded hills and streams and offers opportunity for recreational use. Insufficient water areas and lack of adequate public recreational facilities limit utilization of the watershed's potential.

The Indiana State Recreation Plan states that this area is deficient in facilities to meet demands for most outdoor recreational activities. (1)

Projections for the year 2000 presented in the State Recreation Plan indicate needs for two additional regional parks, 19 district parks and numerous community, neighborhood and block parks. A regional park as defined in the State Recreation Plan is at least 1,000 acres in size, of which a minimum of 120 acres are water. Such parks would serve population within one hour driving time. District parks as defined would vary between 400 and 800 acres in size, of which a minimum of 48 acres are water. These parks would serve population within one-half hour driving time. Community, neighborhood and block parks are smaller yet in size with subsequently shorter travel time and distances.

Plant and Animal Problems

Cropland acreages within the watershed are on the decline, particularly in upland areas. Such areas are being converted primarily to forest land or pastureland use. Some of these areas are allowed to revert to brush which

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

is the first natural successional stage in the evolution of climax forests. Wildlife habitats of forest land and forest land-pastureland "edge" are increasing. This benefits species such as deer and gray squirrel. Forest land-cropland "edge" is decreasing. This will be detrimental to species such as bobwhite quail, cottontail rabbit, and fox squirrel. (6)

Spring and summer flooding destroys eggs and the young of ground nesting animals and birds. Occasionally a brood year of a species within the flooded area could be adversely impacted, and, in some circumstances, completely eliminated by flooding. Effects of sediment laden floodwater and the decrease in water quality on fish have not been specifically evaluated.

Wildlife habitat for upland game and song birds is adequate to support current populations. Deer populations are below the carrying capacity of available habitat because of illegal hunting activities in the area and several dog packs. (21)

Rare and endangered species are not known to exist within the Anderson River Watershed.

Water Quality Problems

A water quality assessment of the watershed was conducted by the U.S. Geological Survey. (24) Generally the surface water in the watershed was found to be of good quality.

Drainage from abandoned coal mines into Lanman Run, Meinrad Hollow, and Swinging Creek appear to be causing significant changes in the chemical, physical, and biological characteristics of these streams. A water sample of Lanman Run above a good sized strip mine had a field pH of 6.5, a specific conductivity (SC) of 105 micromhos, and contained 0.23 milligrams per litre (mg/l) of aluminum, 0.59 mg/l iron and no manganese. A small tributary to Lanman Run further downstream drains a large surface coal mining and storage area. Water from this tributary had a field pH of 3.8, and SC of 520 micromhos, and contained 22.0 mg/l aluminum, 8.2 mg/l iron, and 4.8 mg/l manganese. Effects of this tributary showed up in samples of Lanman Run just downstream of their confluence, not only in the water samples, but also in the nature of the stream bottom materials. Bottom materials changed from clean sand and gravel above the mine to a higher percentage of fine materials (coal fine) below the mine. Similar results were found on Meinrad Hollow and Swinging Creek.

It was also determined that nitrate concentrations were higher in waters flowing from the more intensively cultivated bottoms. At the time of sampling, nitrate concentrations appeared to be related to fecal coliform and fecal streptococci bacteria concentrations. On the basis of fecal coliform/fecal streptococci ratios, the bacteria in the streams probably result from runoff of superficially deposited animal wastes and are contributing to nitrate concentrations. Concentrations of fecal bacteria should be reduced during periods of low flow when surface storm flows would be absent.

Streamwaters flowing from upland areas generally contained less than 0.5 mg/l nitrate nitrogen, which should present no water quality problems for the proposed reservoirs controlling upland drainage areas. Water flowing from the

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

more intensely cultivated bottoms generally contain enough nitrate-nitrogen to cause enrichment and undesirable biologic growth, particularly if associated with an impoundment. However no impoundments are planned for the bottom lands of the Anderson River.

None of the nitrogen values found in the basin are significant with respect to public use or consumption.

Anderson River bottom materials were sampled for insecticide residues at two sites. The sample collected near Birdseye did not contain any residues, but the sample collected near Saint Meinrad was found to contain residues of: chlordane, 3.6 micrograms per kilogram; DDT, 1.0 micrograms per kilogram; DDD, 0.5 micrograms per kilogram; and dieldrin, 2.7 micrograms per kilogram. These concentrations are considered low, but are an indication that these persistent compounds have made their way into the stream system. This leaves open the possibility for accumulation in biological food chains.

Sediment concentration samples were taken only to indicate the effects of Interstate 64 construction on downstream sediment concentration. The sample from Anderson River above the construction area contained 11 mg/l of suspended sediment. The sample below construction on Anderson River contained 22 mg/l or a 100 percent increase in concentration. The samples on Hurricane Creek reflect an even greater increase. The sample showed 12 mg/l above construction and 69 mg/l below the constructed site. When this temporary disturbance of soil is completed and stabilized, the sediment concentrations downstream should again return to the low concentration found upstream.

Economic and Social Problems

Nearly 50 percent of the farms in the four watershed counties had less than \$10,000 total farm product sales annually. (25) Watershed farms are almost exclusively of the family farm type. Exceptions to this are found in flood plain areas where an estimated five percent of the farms employ greater than one and one-half man years of hired labor.

The percent of families with income below the poverty level for Crawford, Perry and Spencer Counties is nearly double the State average. Dubois County, having a broader economic base, was near the State average. Per capita and median family incomes for the four watershed counties was also shown to be below State averages. The following table restates these relationships as percentage comparisons of County incomes to State. (Derived from data in bibliography reference No. 17).

<u>Item</u>	<u>County Average/State Average (percent)</u>			
	Crawford County	Dubois County	Perry County	Spencer County
Per Capita Income	72	85	76	74
Median Family Income	67	90	80	78

Additional employment opportunities are needed in Perry and Crawford Counties to lower unemployment from the current rates of 13.2 and 5.6 percent (18) respectively to at least current State and National averages (4.8 to 4.9 percent). (19) Whereas data was not available for Spencer County, it is

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

believed that unemployment rates exceed State and National levels. Dubois County was below the State and National level. The lack of development and conservation of land and water resources has retarded improvement to social and economic conditions.

IV. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

Implementation of zoning ordinances in the State of Indiana, is a power delegated to County government. No State or local land use master plan exists in the watershed area. Zoning is the most reasonable method of preventing undesired development. The necessary combination of using authority and willingness to accept land use controls is currently lacking in the watershed.

V. ENVIRONMENTAL IMPACT

Conservation Land Treatment

Adequate land treatment to be installed on 42,582 watershed acres will reduce average annual watershed erosion from 5.7 tons to 4.4 tons per acre per year. Total watershed erosion will be reduced from 553,892 tons to 427,566 tons, a 23 percent reduction. Sediment concentrations in streams will be reduced proportionally as will flood plain land and crop damages due to sediment deposition. Sediment delivery to the Ohio River will be reduced approximately 23 percent. The value of surface waters for fish and wildlife will be increased by reductions in sediment concentrations and attached chemical pollutants.

Land treatment includes crop residue management, minimum tillage, pasture and hayland planting, grassed waterways, diversions and grade stabilization structures. These will reduce erosion through interception or reduction of runoff and through stabilization of drainageways. Reduced sheet erosion will permit soil fertility to be maintained. Crop damage associated with poor stands will be reduced, as will permanent land damage from gully erosion.

Pasture planting and management practices will improve overall quality and productivity. They will reduce erosion on approximately 13,210 acres of grassland to be treated. Such areas when properly treated and managed complement the overall farm operation. They contribute significantly to farm income with a minimum of erosion risk. Approximately 170 ponds will be constructed resulting in better pasture management and improved fish and wildlife habitat.

Tree planting on 430 acres of private land and protection of an additional 750 acres of private forest land from grazing will improve hydrologic condition and thus retard runoff and erosion and improve water quality. Intensified management practices will increase productivity of about 5,480 acres of private forest land resources and enhance wildlife and recreation values. Management of public forest land resources for multiple use objectives will contribute to man's enjoyment of nature and greater usefulness of the resources.

Three hundred and ten acres with critical erosion problems will be stabilized by land treatment. This will reduce sedimentation of streams and preserve such areas for future use. At the same time it will enhance their natural beauty.

V. ENVIRONMENTAL IMPACT

Field borders will be planted on 1,038 acres. Wildlife habitat will be developed and managed. The additional protective cover will increase and perpetuate wildlife numbers. Critical area plantings, pasture planting, grassed waterways, and tree planting add to protective cover.

The Soil Conservation Service will continue to provide technical assistance, through Soil and Water Conservation Districts, for installation of land treatment practices to improve crop, pasture, and woodland management. These will enable farmers to achieve a better income balance from their various land use commitments. Pressures to commit watershed land resources in the short run, to uses more intensive than are consistent with long run capabilities, will be reduced.

Overall effect of the land treatment program on land use will be a reduction of cropland acreage of 7,665 acres, an increase in pastureland acreage of 8,012 acres, an increase in lands managed for forest land purposes of 1,978 acres, and a decrease in land in other uses of 2,325 acres.

Land treatment to be installed above structural measures will reduce the quantity of sediment currently delivered to structure sites by 23 percent. This reduces the cost for sediment storage capacity, improves efficiency of structural operation, and extends structural life. In addition flood damage throughout watershed flood plain areas will be reduced by an estimated three percent.

Structural Measures

Installation of the planned structural measures will produce an overall reduction in evaluated monetary flood damages of 45 percent. This reduction together with the 3 percent reduction accruing through the land treatment program will provide a total damage reduction of 48 percent. Crop and pasture damages will be reduced by 46 percent, other agricultural damages by 53 percent, road and bridge damages by 64 percent, and flood plain scour by 52 percent. An estimated 120 agricultural landowners in the flood plain will benefit directly from the project. The following table illustrates with-project percent damage reduction and average annual acres flooded with and without project. This data is based on headwater flooding only and does not include backwater effects from the Ohio River.

V. ENVIRONMENTAL IMPACT

Evaluation Reach	Percent Damage Reduction	Acres Flooded	
		Without Project	Average Annual With Project
1	0	1,359	1,317
2	26	403	263
2A	34	621	390
3	37	676	392
4	36	591	365
5	32	1,356	866
6	53	885	442
7	71	2,319	745
8	61	398	146
9	86	513	87
10	97	134	5
11	59	219	105
12	38	172	106
13	44	170	92
14	100	48	0
15	37	33	23
16	91	159	21
18	53	214	102
19	76	84	26
20	49	651	337
21	31	242	173
22	28	365	276
23	41	187	105
24	37	198	118
25	22	132	106
26	93	66	5
27	65	143	56
28	41	206	120
29	100	16	0
30	99	63	0
40	17	189	189
41	18	131	117
42	13	162	131
TOTAL	48	13,105	7,226

Evaluated effects of the project indicate that no portion of the watershed will suffer flood increases. Flood damages on the lower main stem from Saint Meinrad to the Ohio River will be reduced by an average of 30 to 35 percent. Flooding caused by backwater from the Ohio River in these reaches will be unaffected by the project. Flood damages on main stem flood plain areas upstream of Saint Meinrad will be reduced by an estimated 67 percent.

Damages below structures on Hurricane Creek, Brushy Fork, and Blackhawk Creek will be reduced by an average of 37 percent, 58 percent, and 49 percent respectively.

V. ENVIRONMENTAL IMPACT

Flood stages and discharges expected with project will be considered in the design of roads and bridges in flood plain areas. Flooding in such areas will be reduced, not eliminated. Farm management decisions to intensify production of agricultural crops will be carefully considered in view of anticipated damage reductions and remaining flood risks.

Reductions in flood hazards will make it possible for farmers to more fully utilize flood plain land. An estimated 220 acres of such land will be voluntarily converted from non-cropland uses to cropland as a result of the project. More intensive use of 2,045 acres of flood plain cropland will also result, as farmers increase the level of technology used in crop production. Farm operators will be able to plant and manage continuous row crops (corn and beans) without fear of crop loss or damage by frequent flooding.

The following table summarizes expected flood plain land use changes that will occur as a result of voluntary farm management decisions. These changes will result in crop and pasture flood damage reductions and account for approximately five percent of project flood prevention benefits. Expected land use changes were judgment estimates based on: (a) interviews with farm operators, (b) analysis of the reduction of flood hazards with project installation, and (c) consideration of technological trends.

<u>Land Use</u>	<u>Without Project-Acres</u>	<u>With Project-Acres</u>
Cropland	6,372	6,592
Corn	(3,960)	(4,095)
Soybeans	{ 1,414 }	{ 1,462 }
Wheat	{ 358 }	{ 373 }
Oats	{ 71 }	{ 73 }
Hay	{ 569 }	{ 589 }
Pastureland	351	276
Forest land	1,036	891
Other	305	305
TOTAL	8,064	8,064

The trapping effect of detention type storage in structures will reduce sediment discharge by approximately 94 percent from the 55.57 square miles of controlled watershed drainage area. Such reduction constitutes a 27 percent decrease in sediment concentrations in watershed stream flows. This added to the 23 percent reduction from the planned land treatment program, yields an overall watershed reduction of 50 percent. Such reductions will reduce channel deposition in localized areas, reduce water turbidity throughout the watershed and enhance the aesthetic qualities of water.

The estimated 40,000 tons of sediment delivered annually to the Ohio River under current conditions, will be reduced to approximately 20,000 tons with installation of all project measures.

Channels downstream from structures will experience decreased flood flows as a result of the project. Sediment concentrations and attached contaminants in watershed stream flows will be decreased by 50 percent, thus augmenting the quality of the water. Base flow of watershed streams is expected to increase.

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Multilevel gated outlets on multiple purpose structures Nos. U-1 and U-10 will allow for the beneficial regulation of water quality in base flow discharges passed through the structures to downstream fishery areas.

The streams and reservoirs in this area support only warm water fisheries.

The stored water at the two larger dams is expected to be in thermal stratification during the warm weather season of the year. This will result in a cold water zone (hypolimnion) and a surface layer (epilimnion) with fluctuating water temperatures which may be higher than the inflow temperature during day time.

The stratification and bottom discharge will have a warming effect on the waters in the impoundments and a cooling effect in the stream for some distance below the dams.

The general effect on the fish population and other aquatic organisms is expected to be negligible.

Reductions in flooding resulting from the project will reduce scour erosion damages on 369 acres of agricultural flood plain by an estimated 52 percent. Reduced scour will allow for partial recovery of lost productivity on these areas. Flood related contamination of watershed streams by sediment, agricultural chemicals and animal wastes will be reduced in proportion to the reduction in flooding. The stabilization of significant stream bank erosion within the planned channel work will result in decreased sediment contamination of the Anderson River.

The general public will benefit from a reduction in indirect damages. Such benefits will be realized through less traffic rerouting and work schedule interruptions.

Municipal water stored in structure No. L-24 (120 acre-feet) will provide a dependable water supply for projected growth through the year 2020 at the Saint Meinrad Archabbey. Estimated population for the Abbey at that time is 1,645 persons. Industrial water stored in structure No. U-1 (100 acre-feet) will provide water for potential industrial development at the Town of Birdseye. Water quality in both instances will meet State requirements for its intended use. (26) The users in turn will meet the Indiana State Board of Health requirements in the treatment of their waste effluent. (4)

Impact of the planned municipal and industrial water supply storage on the economic development of the area will be greatest in the communities of Saint Meinrad and Birdseye. Some effect is expected in the surrounding watershed in helping to utilize underemployed human resources. That significance is expected to be small.

Permanent pool areas of planned structures will inundate 12.1 miles of perennial warm water stream fishery and 8.5 miles of intermittent feeder streams. The fishery in these reaches will be destroyed by inundation and be replaced by a lake fishery. Minor disruption of the stream fishery and immediate overbank area will also occur along a 10.5 mile reach of the Anderson River main stem in which channel work is planned. Disruption will be temporary

V. ENVIRONMENTAL IMPACT

and will result from flow obstructing debris, fallen trees, and trees in danger of falling, being removed from the channel. Only trees marked by a multiagency review team will be removed.

Existing lakes or ponds will not be affected by the project. Wildlife wetland areas are virtually non-existent in the watershed, and none are expected to be created through the installation of project structural measures.

Rare or endangered plant species are not expected to be affected by installation of the proposed project. Ecological balance is not expected to change significantly within the project area.

A number of land use changes will occur in areas committed to the installation of structural measures. Current land use within structure permanent pool areas (sediment, recreation, and water supply pools) will be replaced by open water storage. An estimated 1,103 acres will be affected involving 616 acres of forest land, 482 acres of cropland and pasture and 5 acres of roads. The impact of these conversions on wildlife will be the total replacement of 1,103 acres of terrestrial forest land and edge habitat by 1,103 acres of aquatic habitat.

Dam and emergency spillway areas involving 171 acres will also be subjected to land use changes. These areas, consisting of 95 acres of forest land, 75 acres of crop and pastureland and one acre of roads will be reshaped during construction and permanently vegetated with a mixture of herbaceous and/or woody plantings. Temporary disruption of wildlife will result from these conversions, but under aged conditions these areas will evolve into grassland and brush habitat offering a variety of food and cover plant species.

Relatively minor land use conversions will occur in flood pool areas (623 acres). Extent of these changes will be limited to shifts from cropland to pasture. Periodic flooding of flood pool areas will cause temporary disruption of use by terrestrial wildlife, but will in turn create temporary aquatic habitat.

It is not anticipated that project measures will affect significantly the recoverability of the watershed's mineral resources.

Planned channel work will not result in any significant land use changes. Approximately 156 acres of land in structure No. U-10 recreational development will be converted to recreation use. This area currently consists of 106 acres of forest land 47 acres of pastureland, and 3 acres of cropland. Wildlife activities within the recreational development will be somewhat disturbed by human activities during the summer months when the facility will be most heavily used.

A summary of the impact of all project measures on watershed land use is presented in the following table.

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		WITH PROJECT *			
Land Use	Current Acres	After Without Project Land Treatment (Ac.)	After Accelerated Land Treatment Application (Ac.)	After Structural Measure Installation (Ac.)	After Flood Plain Land Use Conversion (Ac.)
Cropland	26,241	23,229	18,576	18,152	18,372
Pastureland	22,901	26,050	30,913	30,703	30,628
Forest Land	38,622	39,399	40,600	39,711	39,566
Open **					
Water	80	80	80	1,183	1,183
Other Land					
Wildlife & Recreation	1,052	1,705	2,715	2,863	2,863
Idle and ***					
Miscellaneous	8,278	6,711	4,290	4,562	4,562
Watershed Total	97,174	97,174	97,174	97,174	97,174

* Project effects are cumulative from left to right.

** Includes areas greater than 2 acres, does not include streams.

*** Includes farmsteads, roads, urban areas, strip mines, etc.

Land acquired for multiple purpose structures Nos. U-1 and U-10 and structure No. U-10 recreational facility will provide for public access. Availability of recreation and fish and wildlife resources in these areas to potential users will be expanded. Land used for single purpose flood prevention structures along the planned channel is expected to remain in private ownership.

Structures Nos. U-1 and U-10 recreational developments will provide opportunities for swimming, picnicking, boating, fishing, camping and nature study during the approximate 200 day recreation season. The recreational development at structure No. U-1 will accommodate approximately 2,000 people on a typical heavy use day. The recreational development at structure No. U-10 will accommodate about 1,600 recreation visits on a typical heavy use day. The estimated annual recreation use at structure No. U-1 is 103,625 recreation visits and 71,500 recreation visits at structure No. U-10.

Approximately 70 graves from the Blunk cemetery are located within the proposed permanent and retarding pools of structure No. U-1. Remains from these graves will be moved to some appropriate location above floodwater elevations. Removal of remains and subsequent re-burial will be accomplished according to Indiana law and State Board of Health regulations. This will be accomplished prior to or during construction of the dam.

The remains of an old grist mill buhr is reported to exist near the outlet of Mitchel Creek. Section 31, T2S, R2W. This is in the permanent pool of structure No. U-1. An intensive search has failed to locate these remains. No other known areas of archeological, historic or scientific interest will be affected by the project.

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Annual mowing of those areas planted to grasses on dams and emergency spillways will temporarily disrupt use by wildlife. Periodic channel maintenance involving trash and debris removal will also temporarily disturb wildlife.

Economic and Social

Increased employment opportunities will be made available to local unemployed and underemployed laborers in project construction and in performing operation and maintenance after project installation. This will slow the rate of migration from the watershed. Contractors can be expected to supply most of their needs for unskilled labor for project installation from local sources. Underemployed rural residents constitute the major source of such labor in this area. Project installation will have a direct immediate effect in alleviating local underemployment.

Operation and maintenance of the recreational developments will produce approximately 15 man years of employment annually. Some employment loss can be expected due to the loss of agricultural land in structure and recreational development areas. This will be offset by increased employment because of more intensive use of areas subject to flood hazard reduction. Recreational activity will increase opportunities for local residents to set up income producing enterprises. Examples are fish bait, fresh vegetable and handicraft shops, and riding stables.

The overall watershed economy will experience a general uplift through the secondary impact of the project on local business. This will occur initially through the expansionary effect of construction spending. Realization of primary project benefits such as flood damage reduction, recreation and water supply will place increased demands on suppliers of local goods and services and marketing, processing and transportation facilities. This will sustain the uplift effect throughout the project life.

Increased vehicular traffic is expected to result as potential recreation users seek available recreational opportunities. Principal access routes to the recreation developments and structures Nos. U-1 and U-10 will be State Road 145 and Interstate Highway 64. Highway maintenance cost to watershed residents should not be affected materially. Some potential secondary developments may take place as a result of the recreational opportunities. No significant impact is expected.

There are 46 single purpose flood prevention reservoirs planned. Two of these, U-18 and U-38, are on Federal land administered by the U.S. Forest Service. Eight others, U-4, U-8, U-17, U-28, U-29, U-35, L-6, and L-13 are on State land administered by the Division of Forestry, Department of Natural Resources. Of the 46 single purpose reservoirs planned, 5 appear physically suited or have potential for incidental recreation use. These sites are U-12, U-37, L-30, L-46, and L-55. Very limited private recreation use is expected at those 36 single purpose reservoirs constructed on private land.

V. ENVIRONMENTAL IMPACT

This can be expected primarily from the adjoining landowners and their guests, and will decline as sediment accumulates in the pool areas. Because the project's planned recreational features satisfy the area's anticipated needs, neither the sponsors or private landowners will provide public access at those reservoirs built on private land. Public access at those 10 sites constructed on public land will be controlled in accord with the appropriate agencies management plan. If access is allowed, sanitary facilities will be provided by the agency in accord with all State and local public health and safety regulations.

Installation of structure No. U-10 and its associated recreation development will displace two owner occupied dwellings and one farm operation. The sponsors have determined that replacement dwellings and farms are available within the general area. The economic impact of the lost farm operation to businesses or markets in the area will not be significant. Social ties of displaced persons are not expected to be significantly affected.

Combined effects of land use conversions attributable to project land treatment and structural measures will decrease the watershed acreage used in the production of surplus crops. Some agricultural lands will be lost from the tax rolls in structure and recreational development areas. The effect on total tax revenues in the watershed should be temporary. Adjustment of tax rates in accord with increased earning potentials of watershed areas benefiting from project measures, is expected to more than offset revenue losses from such areas removed from taxation.

Favorable Environmental Effects

- a. Reduce annual erosion from 553,892 tons to 427,566 tons per year, a 23 percent reduction by installing land treatment measures.
- b. Reduce sediment concentrations in stream flows by 23 percent.
- c. Stabilize 310 acres having critical erosion problems.
- d. Implementation of wildlife habitat management and development plans on 1,038 acres.
- e. Create 170 farm ponds complementing pasture enterprises and enhancing fish and wildlife values.
- f. Cause land use shifts consistent with long run capabilities through a reduction in cropland of 7,665 acres, and increase in land devoted to pasture use of 8,012 acres, and an increase in land managed for forest land purposes of 1,978 acres, and a reduction in land in other uses of 2,325 acres.
- g. Reduce watershed flood damages by three percent with land treatment measures.
- h. Reduce the inflow of fertilizers, pesticides and animal wastes into watershed streams.

V. ENVIRONMENTAL IMPACG

- i. Reduce watershed flood damages an additional 45 percent with structural measures.
- j. Reduce flood plain scour on 369 acres.
- k. Reduce sediment concentrations in stream flows an additional 27 percent with structural measures.
- l. Create a major outdoor recreation industry complementing many of the area's scenic and historical points of interest. Two lakes with a combined surface area of 806 acres will provide an estimated 175,125 public recreation visits annually.
- m. Create an additional 297 acres of open water beneficial to fish and wildlife values.
- n. Provide the Town of Birdseye with 100 acre-feet of industrial water supply.
- o. Provide the Saint Meinrad Archabbey with 120 acre-feet of municipal water supply.
- p. Create an uplift in the overall watershed economy through secondary business support activities generated by the project.
- q. Sustain the stream fishery below structure Nos. U-1 and U-10 through the release of cool oxygenated water.
- r. Periodically create 623 acres of aquatic wildlife habitat in flood pool areas.
- s. Increase stream capacity by removing debris blocks and hazardous trees on 10.5 miles of the main channel.
- t. Net increase of 1,811 acres of wildlife and recreation land.
- u. Increase benefits to upland wildlife by less intensive use of erosive cropland.

Adverse Environmental Effects

- a. Eliminate agricultural use of 560 acres in cropland and pastureland 714 acres in forest land in dam, emergency spillway and permanent pool areas of planned structures.
- b. Produce local area reductions in the amount of wildlife habitat available through the inundation of 1,103 acres in structure permanent pools (includes 482 acres of cropland and pastureland, 616 acres of forest land and 5 acres of roads).
- c. Interrupt pasturing activities and wildlife use on 273 acres of pastureland in structure flood pool areas and wildlife use on an additional 350 acres of forest land.

V. ENVIRONMENTAL IMPACT

- d. Reduce wildlife habitat by allowing for the economic conversion of 75 acres of pastureland and 145 acres of forest land to cropland through the reduction of flood damages.
- e. Produce a temporary damaging effect to downstream fisheries during channel construction and subsequent maintenance operations.
- f. Inundate approximately 12.1 miles of perennial stream fishery and 8.5 miles of intermittent feeder streams within permanent pool areas of structures.
- g. Displace two owner occupied dwellings and one farm operation.
- h. Move approximately 70 graves from the pool areas of structure No. U-1.
- i. Increase vehicular traffic in the watershed.
- j. Temporarily disturb wildlife and wildlife habitat during mowing operations on areas of dams and emergency spillways.
- k. Remove 80 trees along 10.5 miles of channel.

VI. ALTERNATIVES

1. One alternative would be the installation of conservation land treatment practices only. Practices and measures of two general types were analyzed, namely those which commonly appear in conservation plans and accrue benefits primarily onsite and those installed for other purposes such as downstream flood reduction.

Land treatment measures of the first type were found effective in meeting watershed needs for erosion protection, for on farm water resource development (e.g.-farm ponds), and for agricultural drainage. In providing erosion protection, these measures were also found effective in reducing downstream sediment problems in the watershed. They would reduce annual erosion from 553,892 tons to 427,566 tons which means sediment contributions to stream flows are reduced 23 percent. These measures would adequately treat approximately 42,600 acres of watershed land and create approximately 170 farm ponds. These measures did little toward reducing flood damages.

Land treatment measures for the specific purpose of floodwater detention were also studied as an alternative. Such measures reduced downstream flood damages only 3 percent at a total cost of \$2,999,403. Required local financing was less with a structural program.

2. A "channel only" solution to watershed problems was never seriously considered by local sponsors. Channel work was considered to be too environmentally damaging to be acceptable. A project of this nature would not give adequate flood prevention and could not meet the recreation and water supply needs of the area. Also, Service policy dictates that if reservoir sites are available these should be investigated first as a solution to flooding before channel alternatives are considered.
3. Nonstructural measures to reduce flood damages were considered as an alternative. Flood plain zoning is an effective means of preventing undesired development and reducing damages. Approximately 80 percent of the flood plain is cropland with a few utilities, roads and bridges and an occasional farm building or home. Implementation of zoning ordinances is a power delegated to county government in the State of Indiana. No zoning regulations exist within the watershed counties. Zoning would also be a means of converting the flood plain to a less intensive use although agriculture is usually considered a use compatible with periodic flooding. A method of flood plain management would be to convert the 4,605 acres of cropland that is now flooded annually, to some less intensive use. The average annual net return foregone by converting this cropland to pastureland would be approximately \$100,000.
4. The first structural solution considered was a plan consisting of land treatment measures, 15 single purpose floodwater retarding structures, 3 multiple purpose structures and 14.8 miles of channel excavation. This combination of land treatment and structural measures would reduce flood damages by 54 percent as well as meet the objectives of erosion control, recreation and water supply. While this proposal had a

VI. ALTERNATIVES

favorable benefit cost ratio, the inclusion of channel work made it unacceptable to the sponsors. The total cost of this alternative solution was estimated at \$8,920,082 with a benefit to cost ratio of 2.1 to 1. (Using the 1969 price base).

5. Another alternative to the proposed action is no project. Adverse environmental effects of the planned improvements would thereby be eliminated, however, a no project solution also implies other adverse effects on the environment. Erosion, continuing unchecked, will continue to defile the streams of the area with sediment. Upland and flood plain soil resources will continue to deteriorate at excessive rates without accelerated land treatment. Lack of flood protection and major water resource development will perpetuate the depressed economic conditions which plague much of the area currently. Nearly \$220,112 of annual net benefits resulting from the project would be foregone if a no project solution were adopted.

VII. SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Present use of watershed lands is predominantly agricultural. Future watershed land use is expected to remain essentially agricultural with some increase in home site developments and private recreational retreats. Greatest concentration of this type development is expected in the heavily wooded portions of the watershed near existing roads. Some home site development is expected on private lands near watershed lakes. To a considerable degree future land use in the watershed is expected to trend toward the development of its multiple use potential, particularly on the less intensively used agricultural areas and woodlands. Sponsors and Service personnel are working with county officials to develop uniform zoning and sanitary regulations that will control private development so that it will be compatible with the environmental objectives of the project.

The planned system of land treatment and structural measures will do much to solve both short-term and long-term problems. Application of improved management practices and treatment needs under the land treatment program on crop, pasture and forest land areas will enable farmers to achieve a more favorable income balance from their various land use commitments. Pressures to commit watershed land resources in the short run to uses more intensive than are consistent with long-term capabilities, will thereby be reduced. In serving the profit motive, owners of these agricultural areas will also serve man and his environment through the perpetuation of much of the area's present beauty and protection of its natural resources. Reduction of flood problems on flood plain areas will also contribute to this end in allowing for increased profitability on currently cropped areas.

Planned measures to be installed under the project will complement projected long-term uses of land, water and other natural resources which are outlined in the Ohio River Basin study and the Indiana Outdoor Recreation Plan. (1) (27) Water resource developments for recreational purposes will serve as focal points from which many of the area's scenic and historical points of interest can be viewed. The project will yield onsite conservation benefits together with offsite benefits in the form of flood damage reduction, public recreation, and municipal and industrial water supply far beyond its projected 100 year life.

Many installed and potential watershed projects are found in this Ohio region, and many applications for assistance are pending. The works of improvement in the Anderson River Watershed will complement the measures already installed in the Middle Fork of Anderson River Watershed project, which is the next watershed to the east.

The Anderson River drains directly into the Ohio River. The Anderson River Watershed comprises 0.07 percent of the Ohio River watershed or region. It is also part of the Evansville-Green subregion as classified by the United States Water Resources Council, and makes up about 0.3 percent of that subregion. Because of the minute percentage of the region and subregion that this watershed occupies, any effect that this work would have on the region or subregion is considered negligible.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Structure permanent pool areas (sediment, recreation, and water supply pools) will occupy 1,103 acres consisting of approximately 482 acres of crop and pastureland, 616 acres of forest land and 5 acres of roads. Agricultural and wildlife uses in these areas will be foregone in creating 1,103 surface acres of water available for recreation and fish and wildlife use. Approximately 12.1 miles of perennial stream fishery and 8.5 miles of intermittent feeder streams will be inundated by such permanent impoundment.

Dams and emergency spillways will occupy an additional land area of 171 acres made up of 95 acres of forest land, 75 acres of crop and pastureland and one acre of roads. Wildlife use of these areas will be interrupted during construction phases but should become reestablished once vegetation (a mixture of herbaceous and/or woody plantings) of the construction areas is complete. Agricultural use including grazing will be foregone in these areas.

Land use in flood pool areas of structures is composed of approximately 273 acres of pastureland and cropland and 350 acres of forest land. This area will undergo relatively little land use change, except for that portion currently in crop which will revert to pasture or "wild" areas. Periodic flooding will interrupt use of these areas by wildlife and livestock.

Approximately 156 acres of land in structure No. U-10 recreational development will be converted to recreation use. This area currently consists of 106 acres forest land, 47 acres pastureland and 3 acres cropland. The labor and materials committed to construction is an irretrievably committed resource.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

The sponsors application for assistance under P.L. 566 was approved by then Governor Harold Handley on September 23, 1960.

In April 1967 the sponsors requested that SCS commence planning of the Anderson River Watershed.

A preliminary investigation report indicating project feasibility was completed in August 1967 and presented to the sponsors. Copies of this report were sent to the then Indiana Department of Conservation and the U.S. Forest Service. The Administrator of the Soil Conservation Service authorized the State Conservationist for Indiana to provide detailed planning assistance in October 1967. Notice of receipt of planning authorization and a request for notification of interest was sent to 10 Federal, State and local agencies. One Federal agency indicated interest in the project.

On January 27, 1968, the Perry County Circuit Court, following the recommendations of the Indiana Natural Resources Commission, established the Anderson River Conservancy District which immediately became a project sponsor. Public hearings were conducted on two different occasions during Conservancy District formation and once during review of a previously developed draft plan proposal. Monthly meetings were held by the local sponsors to sustain interest, establish goals, and to consult with other people that were interested in the project. About 30 meetings were held during project formulation between the sponsors and State, Federal or local agencies as well as the general public. Other unrecorded meetings were held with persons who had special or perhaps individual interests in the project.

Personnel from the Glenn A. Black Laboratory at Indiana University were consulted to determine the location of possible features of archeologic significance within the watershed.

County historical societies were contacted for information on the presence of historic values within the watershed.

Three multiagency fish and wildlife, forestry, and water resources field reviews were held during the course of plan development. Such field reviews involved biologists, foresters, soil conservationists, geologists, and engineers representing the Indiana Department of Natural Resources, Division of Fish and Wildlife and Division of Forestry; the U.S.D.I.; U.S. Fish and Wildlife Service; the U.S. Army Corps of Engineers; Indiana State Board of Health; and the Soil Conservation Service. The U.S.D.I., Geological Survey was employed to conduct a comprehensive water quality study. The specific recommendations made by these agencies were discussed with project sponsors and incorporated into the project plan.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

Discussion and disposition of each comment on draft environmental statement

Comments were requested from the following agencies:

Water Resources Council

*Department of the Army

Department of Commerce

*Department of Health, Education and Welfare

*Department of the Interior

*Department of Transportation

*Environmental Protection Agency

Federal Power Commission

Office of Equal Opportunity, USDA

Advisory Council on Historic Preservation

*Indiana Department of Natural Resources (for Governor)

*Indiana State Clearinghouse

*Indiana State Historic Preservation Officer 1/

Environmental Impact Assessment Project

Natural Resources Defense Council

Indiana Historical Society

Environmental Defense Council

National Wildlife Federation

National Audubon Society

Friends of the Earth

Patoka Lake Regional Planning Comm.

* Did respond

1/ The Director of IDNR is designated as the State Historic Preservation Officer. Comments from him are considered as encompassing both responsibilities.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

SUMMARY OF COMMENTS AND RESPONSES

Each issue, problem, or objection is summarized and a response given on the following pages. Comments are serially numbered. The original letters of comment appear in Appendix D.

Department of Army (Work Plan)

- 1) Comment: The report mentions coal reserves and strip mine damage. However, there does not appear to be any mention of reclaiming the strip mine land areas. It cannot be determined from the report whether or not this is a problem, but consideration should be given to covering this feature.

Response: There are no plans for reclaiming the strip mine land areas. The only problems these areas cause are discussed in the plan under the Water Quality Problems section.
- 2) Comment: Page 37 (now page 23) - Projects of Other Agencies. A number of revisions in the information on Patoka Lake are recommended:
 - a. First line: "Patoka Lake, a reservoir of nearly 9,000 acres (seasonal pool)..."
 - b. Fifth line: "The seasonal (water supply) pool of the lake..."
 - c. Sixth line: "...a point approximately 3 miles west..."
 - d. Eight and ninth lines: "Approximatley 5,000 acres of land will be acquired specifically for...:"
Response: Revisions have been made in plan as suggested.
- 3) Comment: Page 57 (now page 34). In developing the design of the drop inlet spillways, it is suggested that reference be made to model studies conducted by Mr. Charles A. Donnelly, Hydraulic Engineer with the U.S. Department of Agriculture, Agricultural Research Service, Soil and Water Conservation Research Division, St. Anthony Falls Hydraulic Laboratory, in Minneapolis, Minnesota. Mr. Donnelly developed generalized criteria for two-way uncontrolled drop inlets for closed conduit spillways. The results of these studies were published in the Journal of Soil and Water Conservation, Volume 20, Number 6, November-December 1965, entitled "The Two-way Drop Inlet for Closed Conduit Spillways."

Response: Reference has been made as suggested.
- 4) Comment: Page 84 (now page 51), 1st para. The use of \$2.25 as the recreation unit day value to compute recreation benefits for structures Nos. U-1 and U-10 is questionable. Recreation unit values of \$1.00 to \$1.50 were used to estimate recreation benefits for Patoka Lake (currently under construction) which lies just north of the Anderson Watershed.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

The recreation unit value used to compute recreation benefits is considered significant due to the fact that recreation benefits account for 68% of the primary benefits for the recommended plan.

Response: USDA Procedures for Planning Water and Related Land Resources dated March 1974 provides considerable latitude in determining the value to assign a recreation visitor day. It describes two categories of recreational facilities -- "General" and "Specialized". The type facilities at structures U-1 and U-10 are of the "general" category consisting of recreation activities attractive to a large majority of outdoor recreationists. Unit day values for general facilities may range from \$.75 to \$2.25 depending upon the quality of facilities and number of different recreation activities provided. Since these two facilities each are well developed, have modern campsites, beaches, flush toilets, picnicking and outdoor play areas, fishing and boating the \$2.25 per visitor day is appropriate.

- 5) **Comment:** Page 155 and 156, (Now Figures 1 and 2).
- a. Unless the design flow of the spillways is entrenched in unweathered hard rock, it is suggested the spillways be located further away from the dam as spillway flows could erode through weathered rock or overburden and endanger the dam.
 - b. It appears that a continuous vertical sand drain should be constructed just downstream of the core to intercept seepage through the fill. The vertical drain should be connected to the foundation trench drains.
 - c. Bedrock openings under the entire embankment fill should be sealed with sanded grout to prevent piping of overburden and/or fill into the bedrock. A grout curtain should be provided where bedrock is exposed in the valley bottom and abutments.
 - d. The dam cross section does not show what slopes are proposed. By scale, the slope is 2-1/4 H to 1 V. This is too steep for mowing. Mechanical equipment slips on such a slope and starts rutting and bare spots. The slope should be 1 on 2-3/4 to 1 on 3 as a minimum.
 - e. The need for riprap on the upstream slope should be considered for the single purpose structures.

Response: Figures 1 and 2 are not intended to be a design or construction drawing. Each structure will be individually designed considering all mentioned items based on foundation studies and soil mechanic analysis. Narrative under Works to be Installed, Reservoir Type Structures has been revised to more clearly state the infrequent use of the emergency spillways.

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- 6) Comment: Pages 158-163 (Now Figure 4). The fluctuations of the 100-year profile alternately either side the 1959 flood, by several feet, appear reflective of some inconsistencies in basic assumptions for the backwater computations. The impact on study findings may or may not be significant.

Response: Careful consideration was given to this very point. It must also be recognized that the 1959 flood was generated from a natural storm event and the 100 year was generated from a synthetic 24 hour storm. The two can be and often are quite different in effect on flood profiles. Consideration was given to changing the back water computation in order to make the two profiles more nearly parallel. The without project economic damages seem to be reasonable when compared with interview data and therefore the routing model was considered adequate.

Department of Army (EIS)

- 1) Comment: Coordination with other federal, state and local agencies, organized groups and citizens seems incomplete. Several agencies, including the U.S. Department of Housing and Urban Development at Indianapolis, Ohio River Basin Commission, and Federal Energy Administration, were omitted from the coordination list. Dr. James H. Kellar, Indiana State Archeologist, and Mr. Joseph D. Cloud, the Indiana Historical Preservation Officer, should be added to the state agency list. Coordination with Mr. Cloud appears desirable due to the reported existence of an old grist mill adjacent to Mitchel Creek. It is noted on page 16 (now page 9) that this mill would be in the permanent pool of structure No. U-1. News agencies were also omitted from the coordination list. Addition of newspapers would be of benefit to the public as this presents them an opportunity to voice their interest or disagreement with the project. Key groups active in Indiana such as Sierra Club, Audubon Society, Izaak Walton League, Indiana Eco-Coalition and others need to be given the opportunity to review and comment on the EIS.

Response: Coordination with agencies were made as directed by Soil Conservation Service Guidelines.

The list of agencies, organizations and groups in the draft environmental impact statement to which statements have been sent and comments requested is incomplete.

All agencies, organizations and groups listed in this comment, with the exception of the Department of Housing and Urban Development, and news agencies, have received a statement and been given the opportunity to review and comment.

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- 2) Comment: It is unclear how benefits are justified for water supply (see page 4, now page 3). No need for additional water supply is expressed until 1985 and that appears speculative.

Response: A project goal is to provide additional water supplies to meet the future needs of the Archabbey at St. Meinrad and the Town of Birdseye. Both have expressed interest in developing additional water for future use and hired a consulting engineering firm, Midwestern Engineers, Inc., Loogootee, Indiana, to study their future water needs and alternative sources.

The engineering firm has indicated that the Archabbey will have a need for additional water supply after about 1985. This is based on an expected increase from 669 people in 1969 to 1,645 people in 2020. They recommend that the Archabbey develop 100 acre-feet at structure L-24 in the Anderson River Watershed as the cheapest alternate source of additional water. This would be adequate to meet their expected needs to the year 2020.

Midwestern Engineers, Inc. also studied Birdseye's future water needs. They concluded that Birdseye now has a source of water which is adequate for both present needs and future growth of the town. Water is not considered adequate however, for any future industrial needs. Therefore, additional water supplies are necessary to attract industry which in turn should stimulate the towns economy. Midwestern Engineers, Inc., therefore recommends that Birdseye obtain 100 acre-feet of water storage in structure No. 1 of the Anderson River Watershed as their cheapest alternative source of additional water. Benefits are based on the next cheapest alternative.

- 3) Comment: The EIS indicates on pages 25 and 26 (now pages 14 and 15) that oil and gas are produced in small quantities and that exploration activites in Southern Indiana are on the increase. Recent production figures could be added here. Will the increased production have any effect on the water quality or the proposed structure?

Response: Any increased production would be subjected to existing State and Federal laws regulating wells. It is the responsibility of the enforcement agencies to see that these laws are complied with. If all laws are complied with, there will be no effect on the water quality of the proposed structure.

- 4) Comment: Since most of Perry County's coal reserve lie within the watershed and coal is also present in Crawford, Spencer, and Dubois Counties, will construction and operation of the proposed plan restrict removal of the coal and if so to what extent?

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Response: Based on information furnished by the Indiana Department of Natural Resources, Geological Survey, Coal Section and the Bureau of Mines, future mining will not be restricted.

- 5) Comment: The watershed is primarily an agricultural area. Consideration should be given to net losses and net gains to agricultural productivity.

Response: Minimum land rights for the 46 single purpose floodwater retarding structures and the land required for the 3 multiple purpose structures will remove from production about 392 acres of cropland and 507 acres of pastureland.

It is estimated that with flooding these cropland acres produce about 60 bushels per acre of corn and 20 bushels of soybeans. Thus about 14,600 bushels of corn and 1,800 bushels of beans will not be produced annually because of inundation of cropland by the combined watershed structures.

With project, reduced flooding will increase yields on 6,372 acres of flood plain cropland in the estimated amounts of 118,500 bushels of corn and 14,700 bushels of beans annually. Thus a net annual increase in production of 103,900 bushels of corn and 12,900 bushels of beans will be produced on the watershed flood plain land with project installed. There will also be some increase in wheat and hay production.

- 6) Comment: The Plant and Animal Resources section appears deficient in some areas. For example, there is no discussion or listing of principal or unusual plant and stream species (fish, arthropods, etc.). An evaluation cannot be made by the reviewer if the base information is lacking. As a matter of note, there is no discussion of the specifically expected effects of impoundment on the aquatic biota above, below or within the project area. The authority for each designation of rare/endangered species should be cited and the criteria for such designation described if the discussion is to be retained. The advisability of retention is questioned as the referenced species are not placed within the sphere of project impact. It is also questioned whether a correlation should be made between the woodrat and karst topography (see p. 37, now page 21) as that topography is not the determining factor in the presence of the species. The species list located in Appendix C should be source referenced.

Response: The EIS states that no rare and endangered species are known to exist in the Anderson River Watershed. Wording regarding rare and endangered species outside the watershed has been deleted. The species list in Appendix C was compiled by the Soil Conservation Service biologists and has been referenced as such.

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- 7) Comment: The surveying and, if necessary, testing of all construction sites and their immediate surroundings by a qualified archeologist should probably be accomplished before construction is begun.

Response: Contact has been made with the director of Glenn Black Laboratory, Indiana University, who provided information about known archeological sites. This information has been sent to the State Historic Preservation Officer. His letter has been included in the consultation section.

- 8) Comment: With respect to the description of projects of other agencies (page 43, now page 25) see Work Plan comment 2, above.

Response: Revisions made as suggested per Work Plan comment 2.

Environmental Protection Agency (EIS)

- 1) Comment: The project will provide water supply for the Archabbey and the Town of Birdseye. The location and environmental impacts of the transmission systems as well as the water intakes should be described. Also, plans for livestock watering areas at reservoir L-24 seem incompatible with its proposed water supply use. Offsite watering should be provided.

Response: The Archabbey's and the Town of Birdseye's stored water will run down the natural channel to a pick up station (see Planned Project Reservoir Type Structures). No plans or information are available, as of this date, for the water intake or transmission from the pick up points. Pick up and transmission of the M & I water is not a part of this watershed plan.

The Archabbey and the Town of Birdseye do not plan to use this water supply in the immediate future. Plans for the pick up and distribution will be developed according to the applicable laws at the time of implementation.

There are no plans for livestock watering at reservoir L-24.

Narrative under Planned Project Reservoir Type Structures has been changed to exclude livestock from the pool on structure L-24.

- 2) Comment: The EIS should expand its discussion of water quality. Possible problems resulting from increased water temperatures within the impoundments should be addressed.

Response: Narrative under Environmental Impact Structural Measures expanded to address water temperature changes and expected effects.

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- 3) Comment: More information should be provided on the description and related environmental impacts of sanitary waste disposal systems at recreation areas. The two largest impoundments- Structures U-1 and U-10 with surface areas of 654 and 152 acres respectively, are located on watersheds that are predominantly forested. Water quality problems should not develop as a result of nutrient buildup from upstream sources. However, sanitary facilities for recreation use at these impoundments will cause an increase in organic and nutrient materials. The discharge from these facilities should be below the dam at each structure.
- Response: Narrative expanded under Planned Project Public Recreation Facilities stating that discharge from sewage facilities will be below the dam and facilities will be designed according to Indiana State Board of Health regulations.
- 4) Comment: Clearing, grubbing and construction of dams for the impoundments will result in an increase of suspended materials. Silt retention dams should be constructed to control siltation from these activities.
- Response: It is Soil Conservation Service policy to construct silt retention dams to control siltation from construction activities. Narrative on page 10 (now page 6) expanded to show this.
- 5) Comment: The project will stabilize approximately 100 acres of abandoned stripmined land. A description of the vegetative and structural measures should be included in the EIS.
- Response: The plan element of stabilizing 100 acres of abandoned stripmined land was developed in accordance with the phase in requirements of Principle and Standards. This element appears only in the Abbreviated Environmental Quality Plan and is not a part of the selected plan. Only measures in the selected plan are discussed in the Environmental Impact Statement.
- 6) Comment: Slightly less than fifty percent of the eight hundred or more farms in the watershed have entered into voluntary agreements with the soil conservation districts. Inasmuch as the conservation treatment of all watershed farm lands is essential to reduce erosion and runoff to acceptable levels and to minimize siltation of the proposed impoundments there should be a proposal in the EIS as to how the half of the non-cooperating farms will be reached with this program and the alternatives that will be pursued if this cooperation is not forthcoming. This latter point poses considerable difficulty because the benefits are not spread equitably throughout the Anderson River basin. Since a breakdown of the cooperators by upland and flood plain farmers is not provided, it must be assumed that land treatment practices other than drainage practices, are being implemented to a large degree by flood plain farmers. The limited success of this program throughout

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the watershed is indicative of the lack of perceived benefits for upland farmers. It is unrealistic to expect the owner of the upland farm to engage in conservation measures for the enhancement of a downstream landowner's property. Granted, the upland landowner would gain in the long term, but it would not be as great in amount nor would it be as timely. This contention is supported by the table of Land Treatment measures (P.42, now page 25) and the imbalance of applied drainage practices to soil conserving practices. If the motivation was stronger for economic return from the soil conserving practices vs. drainage measures, it would be indicated in the balance of the practices applied.

Response: The projected goals for the watershed area is to have 90 percent of the farms under cooperative agreements. It is mandatory according to SCS policy that at least 50 percent of all acreage behind any structure be under cooperative agreement before any construction is started. It is also required by SCS policy that "not less than 75 percent of the effective land treatment measures must be installed, or their installation provided for, on those sediment source areas which, if uncontrolled, would require a material increase in the cost of construction, operation, or maintenance of the structural measure." ^{1/}

Past experience has shown that with continued encouragement and professional and technical help the landowners will voluntarily install needed practices.

It is not correct to assume that land treatment practices are being implemented primarily by flood plain farmers. Pasture planting, pasture management, ponds, terraces, and spring developments are normally considered as upland soil conserving land treatment measures. The table on page 42 (now page 25) shows that \$1,045,783 of soil conserving practices have been applied as compared to only \$636,128 of drainage practices.

Forty percent of the watershed area is in forest land. Forest land is generally accepted as being good land use for erosion and sediment control.

7) Comment: In this same vein, the EIS should elaborate further on the relationship between the Soil Conservation Service, the Soil Conservation Districts and the individual cooperators through whom the land treatment practices will be applied. Inasmuch as the relationship between the Soil Conservation District and the cooperator is voluntary there remains a

^{1/} U.S. Department of Agriculture, Soil Conservation Service, Watershed Protection Handbook, Chapter 4, Section 104.036.

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question as to how the district could deal with the cooperators' failure to carry out planned land treatment measures or deal with changes in ownership and resulting failure to get land treatment measures applied upstream of proposed impoundment sites. This entire issue deals with the success or failure of the project and the protection of the Federal investment.

Response: The cooperative relationship between the Soil Conservation Service, Conservation Districts and their cooperators is of long standing and has proven to be very successful in attaining, or exceeding, required land treatment in other watershed projects.

Narrative under Environmental Impact, Conservation Land Treatment has been changed to show the Soil Conservation Service, Soil Conservation Districts and landowner relationships in land treatment.

8) **Comment:** It is indicated that none of the four counties affected by this project has developed land use plans. The EIS should discuss the potential problems including the secondary impacts of providing significant recreational development in an area that lacks adequate land use controls.

Response: No significant developments or impacts are expected other than those already discussed in the Environmental Impact Statement. Narrative on page 68 (now page 41) expanded to recognizing that some potential secondary developments may take place as a result of the recreational opportunities.

9) **Comment:** In addition, the EIS should address the effects of flood protection on inducing landowners to clear the flood plain of trees for more intensive cultivation. Also, the land use of the areas subject to flood plain scour should be indicated together with the degree of assurance that incompatible land uses will be prescribed on these soils. In view of the limited success of the land treatment program for soil erosion control on upland soils, the Draft EIS should discuss the consequences of this trend as it would effect the achievement of project goals.

Response: Flood protection on Anderson River will not induce landowners to clear the flood plain of trees because the woods are on small tracts in areas where drainage problems exist or where access by farm machinery is difficult (see page 27, now page 16 of EIS). The project will not change these conditions.

Most flood plain scour occurs on presently cropped land. This land will continue to be cropped. Scour will be reduced as a result of reduced depth and frequency of flooding. Only 21 percent of the flood plain land is presently not being cropped. No major change is expected.

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The Soil Conservation Service considers the land treatment program to be very successful. The consequence of this successful program will be reduced erosion and improved productivity.

The Soil Conservation Service will accelerate technical assistance to install land treatment practices during project installation.

Department of the Interior (Work Plan)

- 1) Comment: This work plan does not respond satisfactorily to several concerns which the Department's Fish and Wildlife Service has repeatedly stressed in correspondence since 1972. Foremost among these concerns is the problem of specific designation of lands for wildlife mitigation purposes. The present document provides only a general discussion on locations and proposed management practices on such lands. The Fish and Wildlife Service requested and continues to request specific acreage and locations of such lands so that it can judge whether they will effectively mitigate project-caused adverse impacts on wildlife resources.
- Response: All mitigation provisions recommended by the multiagency review team consisting of biologists from the Indiana Department of Natural Resources, U.S. Fish and Wildlife Service, Soil Conservation Service, and U.S. Forest Service have been incorporated into the Work Plan (pages 47 and 48, now pages 28 and 29). The location is specific in that flood pool areas, dams, and borrow areas will be considered mitigation land at single purpose reservoirs. At multiple purpose reservoirs, these areas plus additional acreage within the boundaries of these developments were determined by the multiagency team to adequately meet the mitigation needs.
- Woody habitat in the sediment pool area will be replaced by water. Most crop and pasture areas will revert to woody habitat in the flood pools. Dams and emergency spillway areas will be planted to ground cover. We feel this is sufficient to base an evaluation.
- 2) Comment: Further, we disagree with the exceptions on pages 62 and 63 (now page 37) which would allow grazing and haying in flood easement areas where such practices presently occur. We do not believe that flood easement areas can be considered mitigation lands if these uses are allowed to continue. Either the easement lands should be set aside as wildlife mitigation lands only or additional mitigation lands must be found.
- Response: Areas subject to pasturing or haying in the flood pool areas are not considered mitigation lands. Mitigation areas otherwise provided for are considered adequate by the multiagency review.

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- 3) Comment: Another of our unanswered concern relates to the fact that environmentally protective measures are not guaranteed prior to construction activities. It is possible that the contractors could make onsite decisions contrary to the planning agreements resulting in more environmental destruction than was anticipated. We recommend that the work plan discussion on channel work and mitigation contain specific language to prevent such a possibility.
- Response: Environmentally protective measures, such as desilting basins, temporary seeding, and noise reduction equipment will be included in each construction contract and its specifications.
- The contractor is not at liberty to make decisions contrary to the construction plan.
- 4) Comment: The second paragraph on page 4 (now Add-12), states that spring flooding often results in the loss of a complete year of a species of ground nesting birds and animals. Unless the animal is limited in its distribution to the project flood plain, any particular year's brood or age class will be represented in other localities. Perhaps this statement could be revised to indicate that occasionally a brood year of a species within a specific geographic area could be adversely impacted, and, in unusual circumstances, completely eliminated by flooding. This comment also applies to the first paragraph on page 32 (now page 20) of the Work Plan.
- Response: The narrative has been changed to incorporate this comment.
- 5) Comment: The kinds and general location of trees to be planted in the reforestation program should be described.
- Response: The reforestation will mainly take place in scattered small tracts throughout the watershed. Species selection and planting will be done according to professional foresters recommendations.
- 6) Comment: The section on Recreation, page 4 (now Add-13), should mention nearby Forest Service recreation area reservoirs of Middle Fork of Anderson River Watershed and associated recreation; Ferdinand State Forest and the Patoka Reservoir currently under construction by the U.S. Army Corps of Engineers. An additional statement should be included to explain why additional recreation provided by the proposed project is needed. Non-water based recreational opportunities also should be mentioned.
- Response: This section of the Work Plan deals with problems in the Anderson River Watershed. These sites are not considered problems and are not in the watershed.

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- 7) Comment: Under Federal Programs, item 1d on page 11 (now Add-17) is in error and misplaced. It should be placed under the U.S. Department of the Interior as item 2c, and the suggested wording is as follows:
- c. Land and Water Conservation Fund - Provides for (1) acquisition of lands for Federally administered recreation areas and (2) matching grants for State recreation planning and State as well as local land acquisition and development. Administered by the Bureau of Outdoor Recreation.
- Response: Concur. Appropriate change has been made.
- 8) Comment: At the bottom of page 11 (now Add-17) we believe the Bureau of Outdoor Recreation should also be listed under number 6 as an agency which will provide technical assistance.
- Response: Concur. The Bureau of Ourdoor Recreation has been added to the list.
- 9) Comment: The section on Plant and Animal Resources, pages 17-19 (now pages 10-11), should include quantitative data of pre-project hunting and fisherman use. This should be broken down by project area (e.g., channel, multi-purpose reservoirs) and include man days use, and total harvest estimates for common game fish, small game, big game, and waterfowl.
- Response: Quantitative data of this nature do not exist. Special studies would have to be made to obtain this information.
- 10) Comment: Any furbearer trapping that takes place in the watershed should be mentioned. Mink, muskrat, and raccoon tracks have been observed in the project area.
- Response: The text has been expanded to discuss trapping of furbearing animals.
- 11) Comment: Information on general types and relative abundance of passerine birds, hawks, owls, and vultures should also be included in this section.
- Response: Concur. Raptors included in the discussion.
- 12) Comment: Project Formulation
- Discussion should include what measures have been taken, if any, to safeguard upstream water quality for structures U-1 and U-10. Since life expectancy of the reservoirs and their use for recreation and by fish and wildlife is dependent upon the present good water quality of the upper Anderson River and Sigler Creek respectively, upper watershed acreage

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under the control of the Forest Service, Indiana Department of Natural Resources and other county governments should be indicated. Potential future uses of the reservoir watershed for mining, logging and other activities that may affect water quality adversely also should be discussed.

Response: The installation and maintenance of land treatment measures will be sufficient to insure adequate water quality. Narrative expanded showing amount of public ownership.

Mining, logging, and other activities that may affect the water quality are controlled by Federal and State laws.

13) Comment: We recommend that power boating not be allowed in the upper reaches of the multi-purpose reservoirs and also that a boating use density plan be implemented upon completion of these reservoirs. Carrying capacity guidelines as used in the Indiana Department of Natural Resources' "State Outdoor Recreation Plan" would help insure that water quality will remain adequate in the multi-purpose reservoirs.

Response: The Work Plan states in the Works to be Installed section that a management plan will be developed for each structure. Consideration will be given to zoning the lakes for various uses.

14) Comment: The discussion on channel work should contain specific language to insure contractor adherence to construction practices which will minimize environmental damage. We suggest the following examples:

"Debris blocks will be removed with the least possible disturbance to trees and vegetation adjacent to the channel bank and to the earth of the channel bottom and banks Debris entirely below normal water line will not be removed Equipment to be used for debris or bar removal will not be allowed in the stream, except floating types. Ingress and egress to each work area will be accomplished without traveling within the channel and without destruction of woody habitat within 20 feet of the channel bank The work area will be only as large as required and any clearing done will preserve desirable trees and not destroy the canopy The contractor will be thoroughly briefed concerning work procedures that are necessary to protect the stream and the involved natural resources."

Response: Concur. This write-up has been revised to incorporate the suggested wording.

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- 15) Comment: On page 43 (now page 26), the ". . . third project goal is to establish and improve wildlife habitat while minimizing habitat losses . . ." A distinction should thus be made between mitigation lands for fish and wildlife and enhancement lands.
- Response: Mitigation lands are described in the Project Formulation section under Environmental Considerations. The discussion on page 43 (now page 26) refers to land treatment measures that are expected to enhance fish and wildlife habitat.
- 16) Comment: We recommend that single purpose reservoirs on public land be open to fishing only to avoid compromising this use with other conflicting forms of recreation.
- Response: Use of single purpose reservoirs on public land will be governed by the agency owning the land.
- 17) Comment: Works of Improvement to be Installed
The section, Reservoir Type Structures, pages 57-64 (now pages 34-38), should specify that the U.S. Fish and Wildlife Service, U.S. Forest Service, and Indiana Department of Natural Resources will review the clearing plans for Structures U-1 and U-10. These agencies also should assist the U.S. Soil Conservation Service in evaluating the impact of any project-related borrow areas outside the structures.
- Response: Concur. The text has been rewritten to incorporate these provisions.
- 18) Comment: The net effect the works of improvement will have in mitigation project-caused adverse impacts in wildlife resources is best demonstrated by pre- and post-project evaluations. The Work Plan should indicate what evaluations are contemplated to determine the effectiveness of planned wildlife mitigation measures.
- Response: No evaluations are specifically contemplated as a part of this plan. However the Indiana Department of Natural Resources, U.S. Fish and Wildlife Service, and Soil Conservation Service will continue to make these evaluations to better determine wildlife mitigation needs for future plans.
- 19) Comment: It is stated on page 63 (now page 38) that sufficient mitigation lands are available for Structures U-1 and U-10 within the purchase boundaries, but no acreages or possible locations are provided. The acres to be affected by reservoir development are known, so the acres needed for mitigation also should be known and identified in the Work Plan. Since the additional lands purchased are primarily for general recreation, wildlife use of much of the area will be discouraged by large numbers of people. Low intensity use areas need

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to be provided and managed for wildlife. We hope such areas will be provided for in the fish and wildlife management plans and that information will appear in the final Work Plan. We recommend that mitigation lands be purchased upstream from Structures U-1 and U-10 in order to provide wildlife habitat and protect water quality in the reservoirs.

Response: Figures 12 and 14 show the purchase area for these two structures. In addition, the Forest Service owns a large block of land adjacent to structure U-1. Approximately 15 percent of the recreational development area of structure No. U-10 and less than 10 percent of recreational area of structure No. U-1 is planned for heavy use.

The multiagency review team report of 1972 states that sufficient mitigation lands exist in purchase areas of these structures.

20) Comment: Although it is not mentioned in the section on Channels, pages 64-65 (now pages 38-39), it is our understanding that only those trees marked during the multiagency tour will be removed from the channel area. The reference on page 64 (now page 38) to "mechanical stabilization" of bank erosion areas by shaping and riprappping is ambiguous. Although it was understood that channel work would not consist of extensive excavation and tree clearing, a detailed description of what actually will take place should be included in the Work Plan. Our previous comments requesting specific language on construction procedures also apply here.

Response: An additional paragraph has been added on page 65 (now page 39) to specify that only trees marked by the multiagency review team will be removed.

The work mechanical has been deleted to avoid confusion.

21) Comment: Nature trails and low intensity public use wildlife areas also should be provided in the public recreation lands, pages 65-66 (now pages 39-40), since some part of the land purchased is to serve as mitigation for wildlife habitat as indicated on page 48 (now page 29). This recommendation should be forwarded to the agencies developing the recreation areas.

Response: The recreation plan on Figure 12 shows a planned nature trail.

22) Comment: Effects of Works of Improvements

In the third paragraph on page 80 (now pages 49-50), the final sentence concerning stabilization of stream bank erosion needs further elaboration, especially the term "mechanical treatment."

Response: The term "mechanical treatment" was intended to mean rock riprap. This term has been substituted to avoid confusion.

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- 23) Comment: Although there may be no major "land use" changes in the flood pools, there will be changes in the forest stand composition in wooded areas subject to periodic flooding. These changes such as invasion of willows, alders, and sycamores should be addressed in this section.
- Response: It has been the experience in Indiana that hydrophiles occur only in the portion of the flood pool along the stream and the permanent pool edge. The water will not be up in the flood pool area for long enough periods of time to create a favorable climate for hydrophiles.
- 24) Comment: The secondary effects of this proposed project need to be discussed. Currently, no mention is made concerning development of homes, recreation cabins, and other facilities which inevitably spring up around man-made impoundments and can result in loss of open space, sewage problems, increased traffic, air pollution, and general degradation of the natural environment.
- Response: No significant developments or impacts are expected other than those discussed in the Environmental Impact Statement. The narrative has been expanded recognizing some potential secondary developments may take place as a result of the recreational opportunities.
- 25) Comment: Investigation and Analyses
- Coal, oil and gas, and stone are currently being produced in the project area. Paragraph 2, page 140 (now page 77) of the Work Plan states that "several coal mines exist within the reaches of the watershed. Coal maps published by the Indiana Geological Survey indicated that shaft mines, strip mines or drift mines are located near the proposed structure sites." It further states that "none of these sites would be adversely affected." Does "not adversely affected" mean current mining will be able to continue unhampered? The plan should also indicate whether or not future mining could be restricted. We suggest that the coal maps indicated above be included in the plan as well as any detailed information of Indiana Department of Natural Resources can supply that would adequately and visually show the extent of the coalbeds.
- Response: The text in paragraph 2 has been revised to state that the shaft mines, strip mines, or drift mines are inactive.
- Based on available information, future mining will not be restricted.
- The coal maps referred to are general and are on a relatively large scale. To reduce them to work plan size would render them almost useless as an accurate means of identifying possible coal reserves.

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According to the head of the Indiana Department of Natural Resources, Geological Survey, Coal Section, there is some possibility that mineable coal might exist at structure sites L-37, L-38, L-40, and L-59. There is no detailed information available from IDMR to adequately and visually show the extent of the coalbeds.

- 26) Comment: The documents also discuss the presence of oil and gas in the watershed area. Paragraph 3, page 140 (now page 77), of the Work Plan states that "Several abandoned oil and gas wells are located in or near the pool areas of Structures U-1, U-10, L-24, L-29, L-32, L-40, L-51, L-54 and L-56." We believe an explanation of "several" is appropriate here in that nine structures are involved. By "several," do the project proponents mean several wells near each structure? The next sentence states that "most of them are dry." We believe the actual number of dry versus producing wells is necessary. In view of the fact that the permanent water pools created by Structures U-1 and U-10 alone have a surface area greater than 800 acres, a map of the project area locating the wells with respect to the structures and pools should be included.
- Response: The text has been revised to more accurately account for the oil and gas wells in the structure areas. The remainder of the paragraph in question explains the necessary precautions which will be taken regarding these wells.
- Maps showing the location of these wells are available at the Paoli Watershed Planning Office.
- 27) Comment: Paragraph 2, page 141 (now page 77), of the Work Plan states that "A small oil well is located 300-400 feet below planned Structure No. L-59 and that this small well should present no structural stability or water contamination problems at this site." However, what is not stated is whether this well is currently producing and whether the well would have to be closed as a result of the proposed structures.
- Response: Reference to this dry and inactive well has been deleted from the text because it is located at an elevation high enough to not be affected.
- 28) Comment: On page 151 (now page 84) of the Work Plan, third line, fourth paragraph, "fecal streptococci" should read "fecal bacteria."
- Response: The word streptococci has been replaced with bacteria.

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Department of the Interior (EIS)

- 1) Comment: Planned Project

Provisions for wildlife mitigation lands should be included in the minimum land rights requirements for Structures U-1 and U-10 as discussed on page 11 (now page 7).

Response: Refer to U.S. Department of the Interior Work Plan comment No. 1 and its response.

- 2) Comment: From the discussion on mitigation on page 15 (now page 9), it appears that flood easement areas of the single purpose structures and multi-purpose Structure L-24 will be set aside and marked as mitigation lands with pasturing and haying to continue if these uses are currently taking place. We do not believe such practices are compatible with managing these lands for wildlife habitat purposes.

Response: Refer to U.S. Department of the Interior Work Plan comment No. 2 and its response.

- 3) Comment: Although it was understood that channel work would not consist of extensive excavation and tree clearing, a detailed analysis of what actually will take place is needed on page 16 (now page 10).

Response: Concur. This write-up has been revised to include the suggested wording from comment No. 14 on the Work Plan.

- 4) Comment: Are the land rights referred to on page 17 (now page 10) temporary or permanent easements? Is the channel to be fenced along permanent and temporary pasture areas through the 10.5-mile reach where project construction will take place?

Response: As the text states, these land rights are permanent. There will be no new fencing constructed as there is currently no permanent pasture along this reach of channel. Any existing fence which is destroyed by construction will be replaced.

- 5) Comment: The section on public recreation facilities also should include information on nature trails and other low intensity public use wildlife areas. The actual relationship of the new facilities to current public use opportunities in the adjacent Federal and State Forest should be discussed.

Response: The narrative has been altered to show that nature trails are planned. The recreation plan indicates that high density use areas are very small.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

6) Comment: Environmental Setting

The discussion on Federal and State holdings on page 31 (now page 18) should indicate whether the proposed project land acquisition areas for Structures U-1 and U-10 will be contiguous with Federal and State holdings. Explicit descriptions of the ownership of lands in the upper watershed of Anderson River upstream from Structure U-1 and in the upper watershed of Sigler Creek upstream from Structure U-10 is needed to properly evaluate the effect of possible upstream mining, logging, and development upon reservoir water quality.

Response: Refer to U.S. Department of the Interior Work Plan comment No. 12 and its response.

7) Comment: The section on plant and animal resources, pages 35-37 (now pages 20-22), should include quantitative data of pre-project hunting, fishing, and trapping. This should be broken down by project area (e.g., channel, multi-purpose reservoirs) and include man days use, and total harvest estimates for game fish, small game, big game, and waterfowl.

Response: Same comment as U.S. Department of the Interior Work Plan comment No. 9. Same response is applicable.

8) Comment: No direct evidence is presented that the project area has been examined by competent professionals to determine whether or not significant cultural resources exist within the watershed.

Response: The director of Glenn A. Black Laboratory of Archeology at Indiana University has been contacted. All known archeological information has been forwarded to Mr. Joseph Cloud, State Historic Preservation Officer, and he has given a letter of concurrence for the project.

9) Comment: The final environmental statement should provide evidence of consultation with the State Historic Preservation Officer (Mr. Joseph D. Cloud, Director, Department of Natural Resources, State of Indiana, 615 State Office Building, Indianapolis, Indiana 42604). We also suggest that Dr. James Kellar of Indiana University, be consulted for a professional archeological reconnaissance survey of all project features in order to locate and assess presently unknown cultural resources.

Response: Contact has been made with both Dr. James Kellar and Mr. Joseph D. Cloud regarding historical and archeological sites in Anderson River Watershed. This fact has been incorporated into the work plan and environmental impact statement.

A letter of concurrence from Mr. Cloud is included in the Consultation section.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

- 10) Comment: The final statement should present procedures to be implemented in the event that previously unknown cultural resources are encountered during project development.
- Response: Reference to action to be taken in the event of historical or archeological items are found during construction has been added to the text.
- 11) Comment: Page 54 (now page 32), second and third paragraphs, of the draft statement should be written as follows:
- "On the basis of fecal coliform/fecal streptococci ratios, the bacteria in the streams probably result from runoff of surficially deposited animal wastes. Concentrations of fecal bacteria should be reduced during periods of low flow when surface storm flows would be absent."
- "It was also determined that nitrate concentrations were higher in waters flowing from the more intensively cultivated bottom lands. Stream waters flowing from upland areas generally contained less than 0.5 mg/l nitrate nitrogen, which should present no water quality problems for the proposed reservoirs controlling drainage areas. Water flowing from the more intensely cultivated bottom lands generally contains enough nitrate-nitrogen to cause enrichment and undesirable biologic growth, no impoundments are planned for the bottom lands of the Anderson River."
- Response: These two paragraphs were not changed. This is the wording prepared by the personnel from the U.S. Geological Survey, who conducted the water quality assessment.
- 12) Comment: The environmental statement fails to mention current or past production of gas and oil in the area. It should note the number of wells, current production capability, and the location of any wells that would be irrevocably preempted by the project. Further, it should indicate the coal seams present, their range of thicknesses, and their areal extent. A discussion of past and present mining operations should also be included. We suggest that the project proponents include copies of the coal maps published by the Indiana Geological Survey and a detailed map that would pinpoint the location of any gas and oil wells in the project area. Any of these resources preempted by the proposed project should be identified in the Section Irreversible and Irretrievable Commitment of Resources. Furthermore, if any of these resources are preempted, paragraph 3, page 65 (now page 39) of the environmental statement, stating that "It is not anticipated that project measures will affect significantly the recoverability of the watershed's mineral resources." should be revised.
- Response: There is one active underground coal mine in section 30, T-4S, R-3W. This mine will not affect or be affected by

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

this project. All other mines, both strip and underground were abandoned shortly after WWII. All information concerning coal and petroleum resources has been provided to us in an updated form by the U.S. Bureau of Mines and the IDNR Geological Survey. Coal and petroleum maps are available in the Watershed Planning Office at Paoli, Indiana.

The responses to U.S. Department of the Interior comment Nos. 25 and 26 on the Work Plan also apply.

- 13) Comment: We believe it would be desirable for the first paragraph of the subsection Recreation Resources on page 38 (now page 22) to recognize that the U.S. Forest Service, acting in concert with the Bureau of Outdoor Recreation, is utilizing Land and Water Conservation Fund monies to acquire substantial lands for recreation in the Anderson River Watershed.

Response: This is not appropriate in the Environmental Setting section of the environmental impact statement. The information has been added under Project of Other Agencies in Work Plan and EIS.

- 14) Comment: On page 43 (now page 25) of the Statement the subsection, Projects of Other Agencies, contains a description of Patoka Reservoir, a U.S. Army Corps of Engineers' project outside the watershed boundary. We believe the Statement and Work Plan should also contain in this subsection, or another if preferred, a similar description of the recreational resources developed in the adjacent Middle Fork of Anderson River Watershed.

Response: A write-up of recreational developments in the Middle Fork of Anderson River has been added to the Recreation Resources section in the EIS and the Work Plan.

- 15) Comment: Environmental Impacts

The Soil Conservation Service estimates that the basin annually loses 40,000 tons of sediment to the Ohio River, page 62 (now page 37), whereas a U.S. Geological Survey report by L.E. Johnson (1971) estimates that only 18,500 tons would be lost per year. Perhaps part of this difference in estimates is due to the lack of a good data base. The final statement should include the source of the figure used, in order to make proper appraisal of the evaluation of impacts possible. The sediment station located at Middle Fork Anderson at Bristow, Indiana, has a data base extending to 1964, and because of the construction of a reservoir in 1968 should be of assistance in anticipating effects in the basin under consideration.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

Response: Gross erosion from the Anderson River Watershed was computed using the Universal Soil Loss Equation (Agriculture Handbook No. 282). Gross erosion was then multiplied by the watershed delivery ratio (from the modified Roehl Curve) to obtain tons of sediment delivered to the Ohio River. The 40,000 tons per year figure obtained is not an absolute value, but merely an estimate based on the best data available (see the Geology subsection of the Investigation and Analyses section of the Draft Work Plan for more detail about this method). The figure of 18,500 tons could not be found in L. E. Johnson's report, "Continuing Sediment Investigations in Indiana, 1971." We assume that this figure was arrived at by multiplying the 122 tons per year per square mile, averaged from data gathered at the Bristow station, times 152 square miles, the drainage area of the Anderson River. The 122 tons per year per square mile would not be typical of the Anderson River Watershed, exclusive of the Middle Fork, at its confluence with the Ohio River. This figure is based on a 1964 to 1971 data average and during this time watershed structures 5, 6, and 7 were completed above Bristow. Individually these structures trap approximately 90 percent of the sediment that enters them. Therefore the annual sediment discharge per square mile of watershed is lower at the Bristow station than it would be for a similar uncontrolled watershed.

16) **Comment:** The estimated amount of fisherman and hunter day use created by the project should be included in this section.

Response: This information is not known. The impoundments included in this project will make a significant contribution to the present deficiency of lake fisheries in the watershed. Such deficiency is noted in the IDNR, Division Of Recreation, Indiana Outdoor Recreation Plan, dated 1970.

17) **Comment:** On pages 62-63 (now page 38), multi-level outlets on Structures U-1 and U-10 are mentioned. What facilities, if any, are to be provided to develop a tailwater fishery and public access below these structures, e.g., a plunge basin and bank fishing areas?

Response: Tailwater fisheries would depend on the wishes of the sponsors. The Soil Conservation Service will encourage this as most of our multiple purpose structures provide such opportunities.

18) **Comment:** Although there may be no major "land use" changes in the flood pools as stated on page 64 (now page 39), there will be changes in the forest stand composition in wooded areas subject to periodic flooding. These changes such as invasion of alders, willows and sycamores should be mentioned in this section.

Response: See response to U.S. Department of the Interior Work Plan comment No. 23.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

- 19) Comment: The secondary effects of this proposed project need to be discussed. Currently, no mention is made concerning development of homes, recreation cabins, and other facilities which inevitable spring up around man-made impoundments and can result in loss of open space, sewage problems, increased traffic, air pollution, and general disruption of the natural environment. In particular, the effect of the proximity of I-64 to proposed Structure U-10 should be fully discussed.
- Response: See response to U.S. Department of the Interior Work Plan comment No. 24.
- 20) Comment: We believe it to be highly desirable that there be a discussion of the manner and degree to which the proposed multiple-purpose recreation structures will compete with or complement Middle Fork of Anderson River Watershed developments. As part of this discussion it may be appropriate to indicate whether or not there are any long-range plans to link together all of the above-mentioned recreation resources as well as others, such as German Ridge Recreation Area, Ferdinand State Forest, and Spring Valley State Fish and Wildlife Area, with a network of hiking trails.
- Response: A paragraph has been added in the Planned Project section of the Work Plan and EIS.
The Soil Conservation Service is unaware of any plans to develop such a hiking trail.
- 21) Comment: Short-Term vs. Long-Term Use of Resources
There should be a more detailed discussion of the long term effect of the project. Will erosion and flooding be controlled after the proposed 49 structures have filled with silt? Will local interests maintain the reservoirs free from excessive silt accumulation?
- Response: The percentage of storage allocated for 100 year sediment storage is very small in comparison to the total storage of the structure. Therefore, the structures will continue to function beyond the project life (100 years) as sediment control and flood control structures.
Adequate sediment storage is provided for each structure for the project life. No provisions are made for removal of sediment.
- U.S. Coast Guard
- 1) Comment: The environmental impact statement should include a discussion of planning for small boat safety and boating education.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

Response: Any program for small boat safety and boating education would be arranged by the recreation sponsors of the multiple purpose structures.

Advisory Council on Historic Preservation

1) Comment: A statement should be made as to whether or not the proposed undertaking will contribute to the preservation and enhancement of non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance. Archeological surveys should be undertaken for areas affected by structural measures, in accordance with Section 800.4(a) of the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

Response: Since no sites have been identified the project will neither contribute to the preservation nor to the destruction of any such sites.

Page 23 contains a statement regarding action if sites are found during construction.

Based on the letter from the State Historic Preservation Officer, SCS determined that no further archeological survey need be undertaken at this time. The entire text of the letter from the State Historic Preservation Officer, Joseph D. Cloud, dated April 10, 1975, states:

"The information you sent on archeological sites in the Anderson Watershed has been evaluated and it was found that no sites will be affected by the proposed impoundments.

There is one structure that may be close to the Saint Meinrad Abbey, a property that is eligible for the National Register. The material you sent does not indicate its specific location in regard to the Abbey and, therefore, prior to any construction, direct or visual effects on the Abbey should be considered."

2) Comment: To ensure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain evidence of contact with the appropriate State Historic Preservation Officer and that a copy of his comments concerning the effects of the undertaking upon these resources be included in the environmental statement.

Response: The afore-quoted letter is evidence that the State Historic Preservation Officer has been contacted.

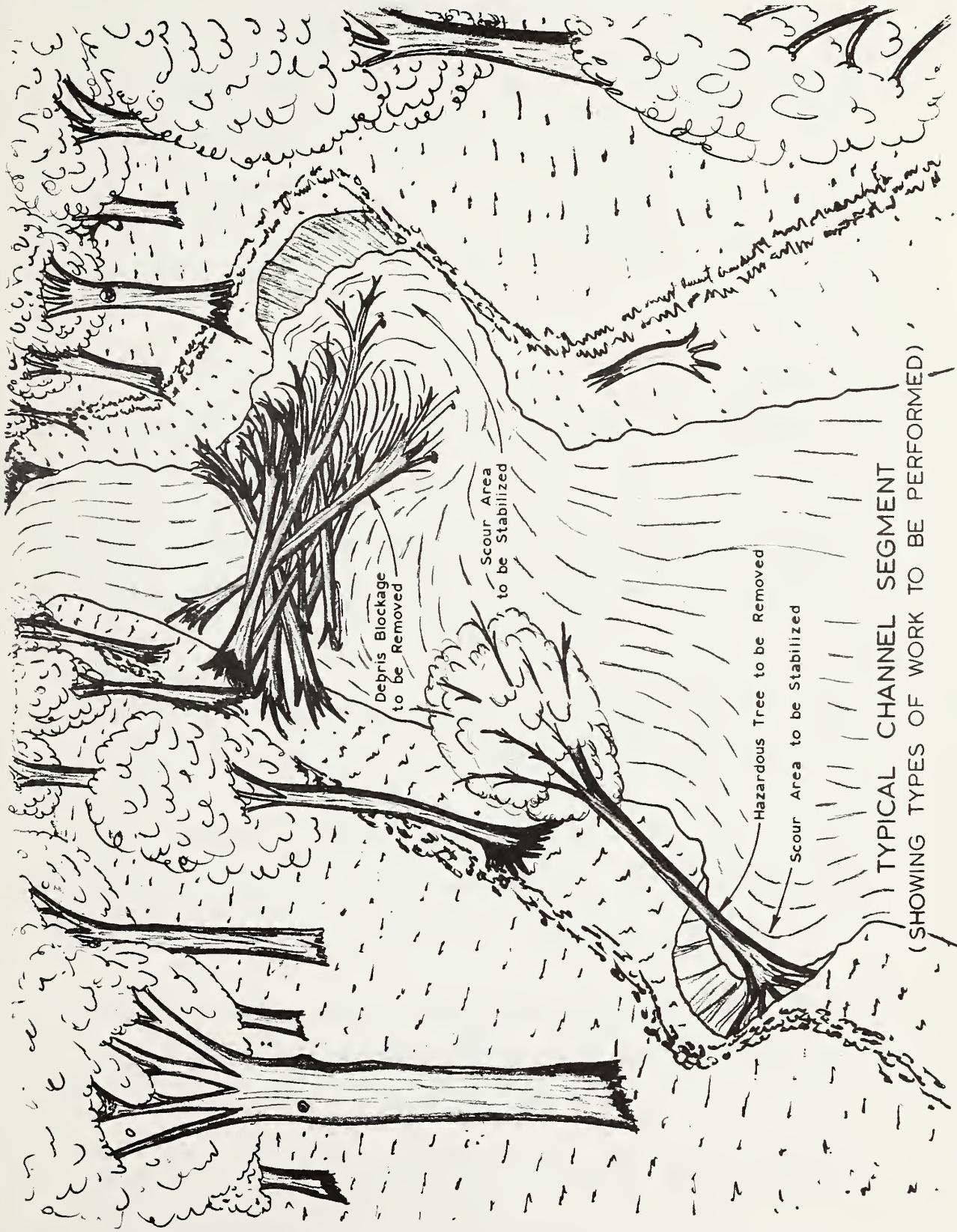
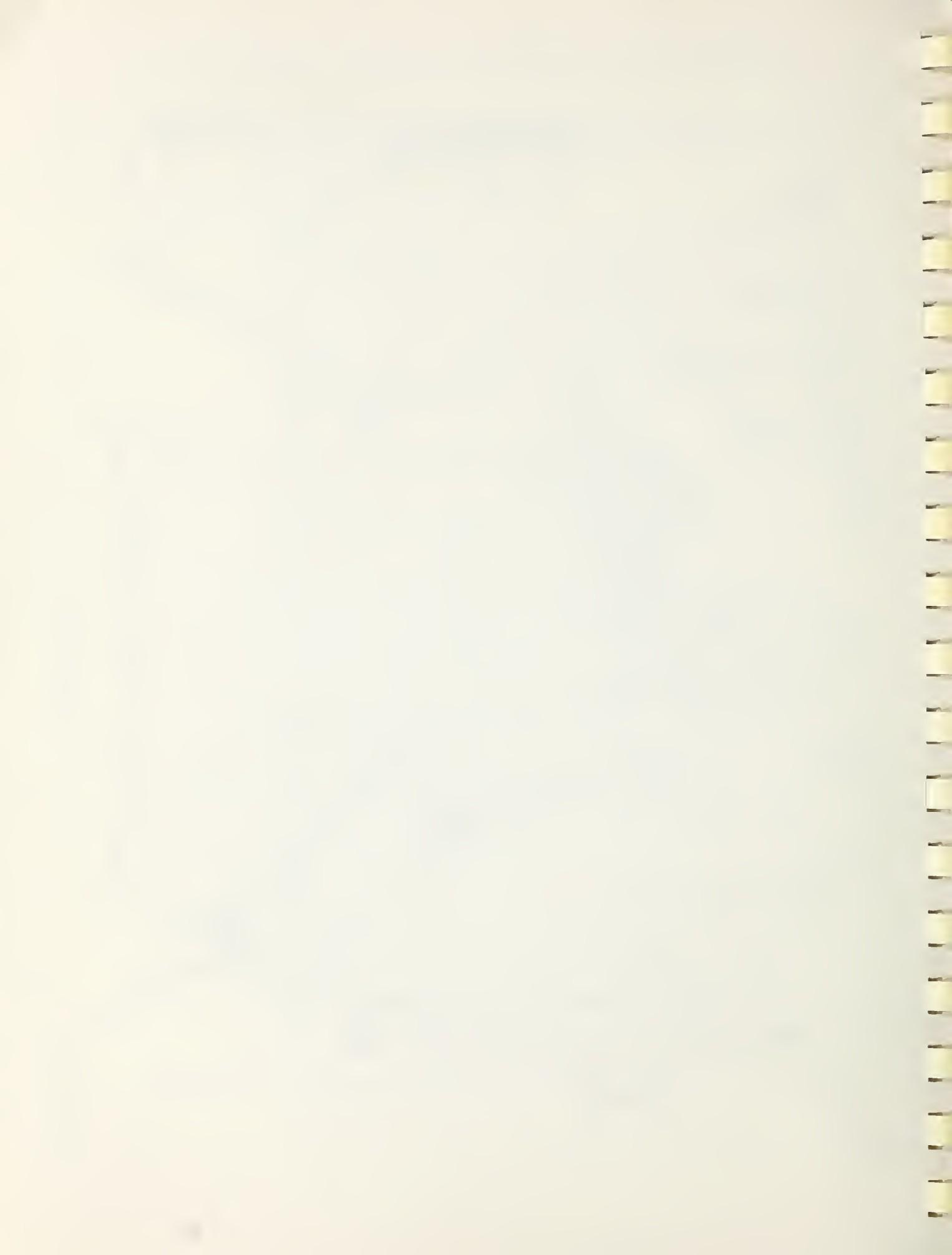


FIGURE NO. 1

5.4-N-30, 228



BIBLIOGRAPHY AND TEXT REFERENCES

1. Indiana Department of Natural Resources. Outdoor Recreation Division.
The Indiana Outdoor Recreation Plan 1970-1975. September, 1970.
2. U.S. Department of Agriculture. Soil Conservation Service. Time-keeping and Progress Systems Codes. Fieldbook. Government Printing Office, July 1, 1973.
3. U.S. Department of Health, Education, and Welfare. Environmental Health Practice in Recreational Areas. HEW Pub. No. (HSM) 92-10009, February, 1972.
4. Great Lakes, Upper Mississippi River Board of Sanitary Engineers.
Recommended Standards for Sewage Works. Albany, N. Y. Health Education Service, 1971.
5. General Assembly of Indiana. "The Indiana Conservancy Act" (and Amendments). Enacted March 14, 1957.
6. All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigation by the Soil Conservation Service, U.S. Department of Agriculture.
7. Water Resources Council. Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources. Washington, D. C.: Government Printing Office, 1970.
8. RHO Chapter, Sigma Gamma Epsilon. A Survey of Indiana Geology. Indiana University, 1966.

9. U.S. Department of Commerce. Weather Bureau. "Climates of the United States, Indiana. Climatography of the United States No. 60-12. Washington, D. C.: Government Printing Office, 1964.
10. U.S. Department of Commerce. Weather Bureau. "Indiana". Climatic Summary of the United States-Supplement for 1931 through 1952. Washington, D. C.: Government Printing Office.
11. U.S. Department of Agriculture. Soil Conservation Service. Soils-Land Capability Class. Soils Memorandum SCS-22. Washington, D. C.: Government Printing Office, May 1958.
12. Carpenter, G. L. and Keller, Stanley J. Oil Development and Production in Indiana During 1969. Indiana Department of Natural Resources Geological Survey. Bloomington, Indiana, 1969.
13. "Appendix E., Groundwater". Ohio River Basin Comprehensive Survey, Final Field Review Draft. U.S. Army Engineer Division, Ohio River-Cincinnati, Ohio.
14. U.S. Department of Agriculture. Forest Service. Summary of Forest Land Data to be Included in the Watershed Work Plan for the Anderson River P.L. 566 Watershed, Crawford, Dubois, Perry, and Spencer Counties, Indiana by Charles Gresham. December 4, 1974.
15. U.S. Department of Commerce. Bureau of the Census. 1970 Census of Population, General Population Characteristics, "Indiana". Washington, D. C.: Government Printing Office.

16. U.S. Department of Commerce. Social and Economic Statistics Administration. Bureau of the Census. 1969 Census of Agriculture, Part II, "Indiana". Volume 1, Section 1, Summary Data and Section 2, County Data. Washington, D. C.: Government Printing Office.
17. U.S. Department of Commerce. Bureau of the Census. Social and Economic Statistics Administration. 1970 Census of Population, General Social and Economic Characteristics, "Indiana". Washington, D. C.: Government Printing Office.
18. Indiana Employment Security Division. Work Force Summaries for Smaller Counties in Indiana, Annual Average, 1970.
19. Indiana Department of Commerce. Economics Research Division. Indiana Fact Book. October, 1971.
20. Indiana Department of Conservation and the Indiana University Department of Zoology. Investigations of Indiana Lakes and Streams. Indiana University, 1945.
21. This information was acquired during a personal interview in December, 1973 with deer biologist John Olson of the Indiana Department of Natural Resources, Division of Fish and Wildlife.
22. Sites of possible archeologic interest were located on topographic maps at the request of the Soil Conservation Service by Dr. James H. Kellar of the Glenn A. Black Laboratory of Archaeology, Bloomington, Indiana, 1972.

23. U.S. Department of Agriculture. Soil Conservation Service.
Predicting Rainfall and Erosion Losses from Cropland East of the
Rocky Mountains. Agricultural Handbook No. 282. Agricultural
Research Service and Purdue Experiment Station. Washington,
D. C.: Government Printing Office, 1965.
24. United States Department of the Interior. Geologic Survey, Water
Resources Division. "A Water Quality Assessment of the Anderson
River Watershed, Crawford, Dubois, Perry, and Spencer Counties,
Indiana" by Mark A. Ayres and William J. Shampine.
25. U.S. Department of Commerce. Social and Economic Statistics
Administration. Bureau of the Census. 1969 Census of Agriculture,
Part II, "Indiana". Volume 1, Section 1. Summary Data. Washington,
D. C.: Government Printing Office, March 1972.
26. Indiana State Board of Health. Stream Pollution Control Board.
Water Quality Standards for Waters of Indiana. Regulation SPC 1 R-3.
August 31, 1973.
27. Ohio River Basin Comprehensive Survey, Final Field Draft.

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APPENDIX A - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

APPENDIX B - PROJECT MAP

APPENDIX C - REPTILES, AMPHIBIANS, MAMMALS, AND BIRDS IN THE ANDERSON RIVER WATERSHED AND VICINITY

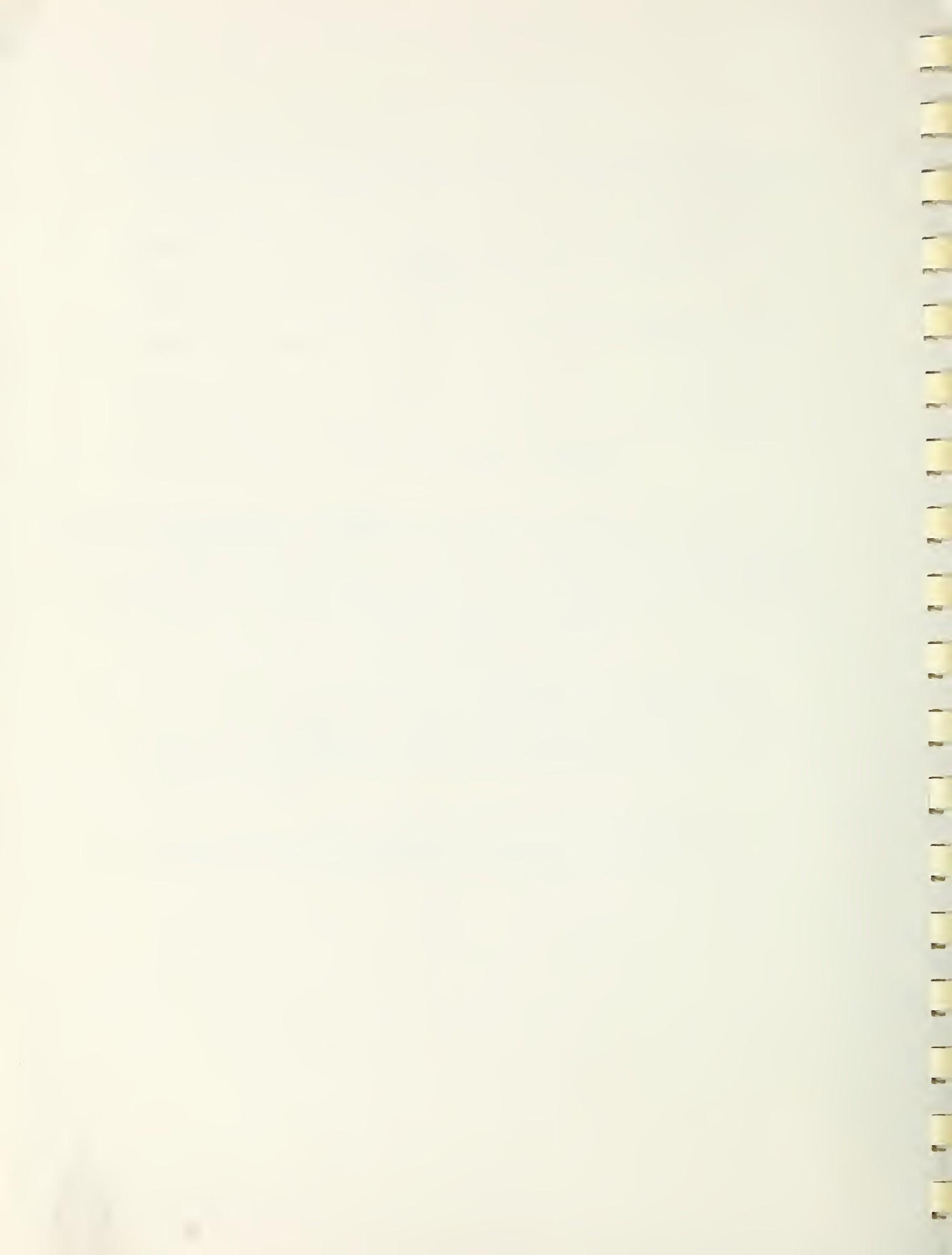
APPENDIX D - LETTERS OF COMMENT RECEIVED ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Approved by

Cleatus J. Gillman
Name and Title

Date:

December 15, 1975



APPENDIX A



COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

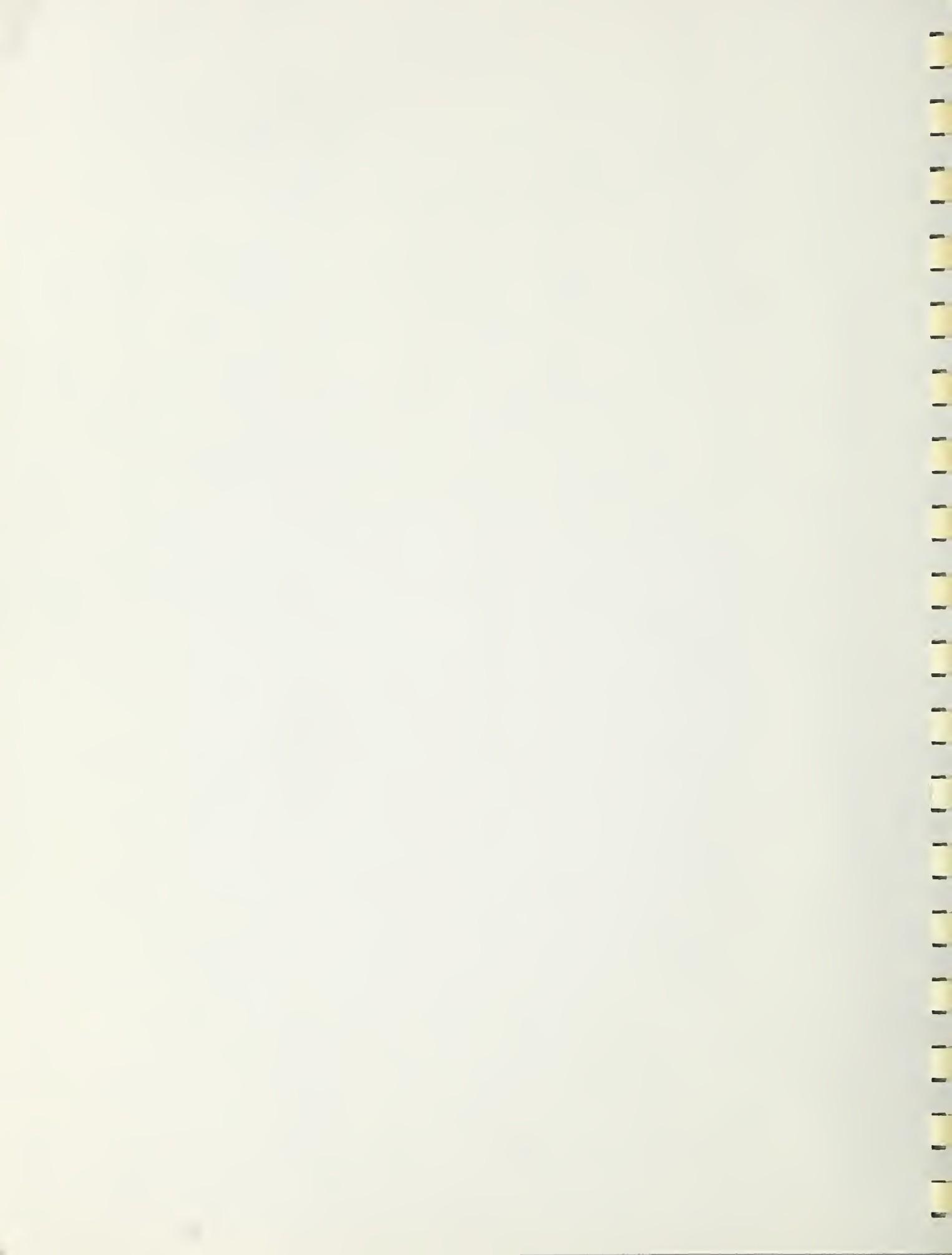
Anderson River Watershed, Indiana

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/						Avg. Annual Cost	Benefit Cost Ratio
	2/ Damage Reduction	Changed Land Use	More Intensive Use	Recreation	M&I Water Supply	Secondary		
ALL STRUCTURAL MEASURES	154,625	8,580	14,030	394,031	6,632	126,993	704,891	1423,269
Project Administration	154,625	8,580	14,030	394,031	6,632	126,993	704,891	1423,269
GRAND TOTAL	154,625	8,580	14,030	394,031	6,632	126,993	704,891	1423,269

1/ Price Base: Current normalized prices, as approved by Water Resources Council - February 1974, for agricultural items and 1973 prices for other items.

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$4,792 annually.



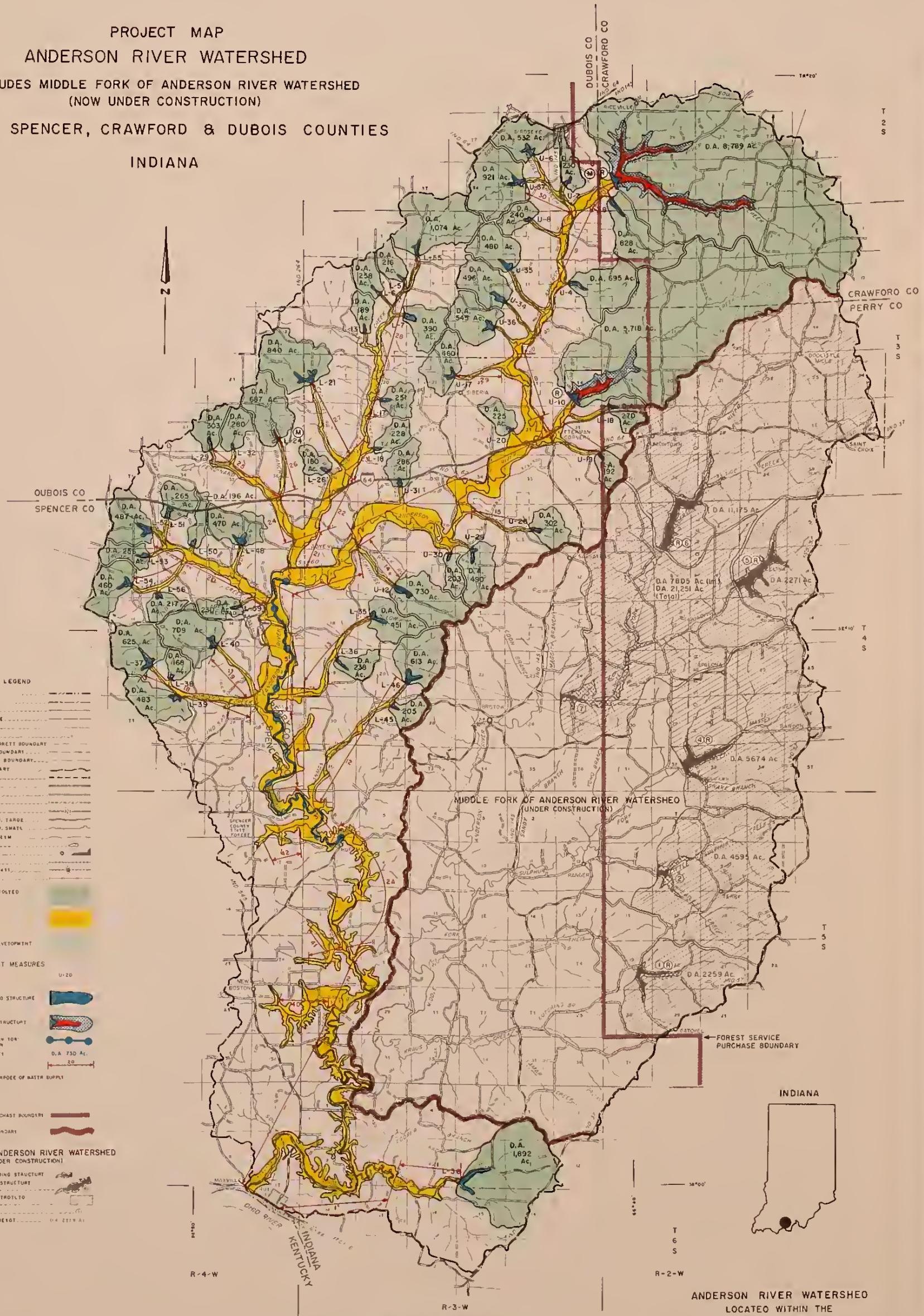
APPENDIX B



PROJECT MAP
ANDERSON RIVER WATERSHED

INCLUDES MIDDLE FORK OF ANDERSON RIVER WATERSHED
(NOW UNDER CONSTRUCTION)

PERRY, SPENCER, CRAWFORD & DUBOIS COUNTIES
INDIANA





APPENDIX C



REPTILES AND AMPHIBIANS IN THE
ANDERSON RIVER WATERSHED & VICINITY

<u>NAME</u>	<u>COMMENTS</u>
Common Snapping Turtle	Range covers the state
Stinkpot (Musk Turtle)	Range covers the state
Eastern Mud Turtle	Range covers NW & SW corner of state
False Map Turtle	*Range covers SW corner of state
Map Turtle	Range covers the state
Midland Painted Turtle	Range covers the state
Red-Eared Turtle	Range covers $\frac{W}{2}$ of state
Eastern Box Turtle	Range covers the entire state except small section of NW corner
Smooth Softshell	Range covers S edge, SW corner & $S\frac{1}{2}$ of W side of state
Eastern Spiny Softshell	Range covers the state
Northern Fence Lizard	Range covers $S\frac{1}{2}$ of state
Ground Skink	Range covers SW corner of state
Five-Lined Skink	Range covers the state except small area in NW corner
Broad-Headed Skink	*Range covers $S\frac{1}{2}$ of state
Western Earth Snake	Range covers $SW\frac{1}{4}$ of state
Northern Red-Bellied Snake	Range covers $SW\frac{1}{4}$ of state
Midland Brown Snake	Range covers state
Midland Water Snake	Range covers $S\frac{1}{3}$ of state
Diamond-Backed Water Snake	Range covers SW corner of state
Eastern Garter Snake	Range covers the state
Eastern Ribbon Snake	Range covers the state except area in NW corner
Eastern Hognose Snake	Range covers the state
Midwest Worm Snake	Range covers the $S\frac{1}{2}$ of state

REPTILES AND AMPHIBIANS IN THE
ANDERSON RIVER WATERSHED & VICINITY

<u>NAME</u>	<u>COMMENTS</u>
Northern Ringneck Snake	*Range covers the S $\frac{1}{2}$ of state
Southern Black Racer	Range covers S 1/3 of state
Rough Green Snake	Range covers S $\frac{1}{2}$ of state
Black Rat Snake	Range covers the state except area in NW corner
Red Milk Snake	Range covers SW corner
Black King Snake	Range covers SW $\frac{1}{4}$ of state
Northern Copperheads	Range covers S $\frac{1}{2}$ of state
Timber Rattlesnake	Range covers S $\frac{1}{2}$ of state
Hellbender	Range covers southern edge of state
Mudpuppy	Range covers the state
Western Lesser Sirens	Range covers W $\frac{1}{4}$ & area 3/4 across Central part of state
Central Newt	Range covers W $\frac{1}{2}$ of state
Red-Spotted Newt	Range covers E $\frac{1}{2}$ of state
Spotted Salamander	Range covers the state except small area of NW corner
Small-Mouthed Salamander	Range covers the state except area along W 3/4 of N state line
Marbled Salamander	Range covers S 3/4 of state
Eastern Tiger Salamander	Range covers the state
Red-Backed Salamander	Range covers the state except small area of NW corner
Zigzag Salamander	Range covers S edge & area up center of state to W edge
Slimy Salamander	Range covers S $\frac{1}{2}$ of state
Long-Tailed Salamander	Range covers S $\frac{1}{2}$ of state
Eastern Spadefoot	Range covers S edge of state

REPTILES AND AMPHIBIANS IN THE
ANDERSON RIVER WATERSHED & VICINITY

<u>NAME</u>	<u>COMMENTS</u>
American Toad	Range covers the state except SW $\frac{1}{4}$
Fowlers Toad	Range covers the state
Northern Spring Pepper	Range covers the state
Eastern Gray Tree Frog	Range covers the state
Blanchard's Cricket Frog	Range covers the state
Western Chorus Frog	Range covers the state
Upland Chorus Frog	Range covers S $\frac{1}{2}$ of state
Pickerel Frog	Range covers the state except areas of NW & SW corners
Southern Leopard Frog	Range covers W 3/4 of S $\frac{1}{2}$ of state
Northern Crawfish Frog	Range covers S e/4 of W $\frac{1}{2}$ of state
Green Frog	Range covers the state
Wood Frog	Range covers the state
Bullfrog	Range covers the state

*May be present in other parts of the state

This information is from Peterson's Field Guide of Reptiles & Amphibians, and
Amphibians and Reptiles of Indiana by Minton.

MAMMALS OCCURRING IN THE VICINITY OF THE ANDERSON RIVER WATERSHED

<u>Name</u>	<u>Habitat</u>	<u>Notes on Local Populations</u>
Opossum <i>Didelphis marsupialis</i>	Farming areas & Woodlands	Common-definitely present
Shortail shrew <i>Blarina brevicauda</i>	Unrestricted	Common-definitely present
Least shrew <i>Cryptotis parva</i>	Open grass-covered areas and marshes	Probably present
South eastern shrew <i>Sorex longirostris</i>	Moist situations-in dense grass	Probably present
Eastern mole <i>Scalopus aquaticus</i>	Gardens, fields and meadows-avoids dry soil	Probably present
Keen's myotis <i>Myotis keenii</i>	Caves, mine tunnels hollow trees or buildings, storm sewers forests	Probably present
Little brown myotis <i>Myotis lucifugus</i>	Caves, mine tunnels, hollow trees, and buildings	Probably present
Indiana myotis <i>Myotis sodalis</i>	Caves in winter-manmade structures & hollow trees in summer	Probably present
Silver-haired bat <i>Lasionycteris noctivagans</i>	Wooded areas	Probably present
Big brown bat <i>Eptesicus fuscus</i>	Caves, mine tunnels, rock crevices, near water, wooded areas, buildings	Probably present
Eastern pipistrelle <i>Pipistrellus subflavus</i>	Well wooded areas Probably roosts in trees during day	Probably present
Gray myotis <i>Myotis griseescens</i>	Caves	Rare-may be present
Evening bat <i>Nycticeius humeralis</i>	Buildings & hollow trees	Possibly present
Red bat <i>Lasiurus borealis</i>	Wooded areas	Probably present

MAMMALS OCCURRING IN THE VICINITY OF THE ANDERSON RIVER WATERSHED

<u>Name</u>	<u>Habitat</u>	<u>Notes on Local Populations</u>
Hoary bat <i>Lasiurus cinerus</i>	Wooded areas	Possibly present
Eastern cottontail <i>Sylvilagus floridanus</i>	Heavy brush, strips of forest with open areas nearby, edges of swamps, weed patches	Definitely present
Eastern gray squirrel <i>Sciurus carolinensis</i>	Hardwood forests with nut trees, river bottoms	Common-definitely present
Eastern fox squirrel <i>Sciurus niger</i>	Open hardwood lots in north, pine forests with clearings in south	Common-definitely present
Eastern chipmunk <i>Tamias striatus</i>	Deciduous forests, brushy areas	Probably present
Southern flying squirrel <i>Glaucomys volans</i>	Woodlots and forest of deciduous or mixed deciduous & coniferous trees	Undoubtedly present
Woodchuck <i>Marmota monax</i>	Open woods, brushy & rocky ravines	Common-definitely/probably present
Beaver <i>Castor canadensis</i>	Streams & Lakes with trees or alders on bank	May be present
Muskrat <i>Ondatra zibethica</i>	Marshes, edges of ponds, lakes & streams, cattails, water lilies	Undoubtedly present
Deer mouse <i>Peromyscus maniculatus</i>	Open to brushy or wooded areas, dry land	Definitely present
White-footed mouse <i>Peromyscus leucopus</i>	Woody or brushy areas preferred, sometimes open areas	Definitely present
Southern bog lemming <i>Synaptomys cooperi</i>	Low damp bogs and meadows with heavy growth of vegetation	May be present
Pine vole <i>Microtus pinetorum</i>	Usually a forest flood with a thick layer of duff, deciduous in north, pines in south	Possibly present

MAMMALS OCCURRING IN THE VICINITY OF THE ANDERSON RIVER WATERSHED

<u>Name</u>	<u>Habitat</u>	<u>Notes on Local Populations</u>
Prairie vole <i>Microtus ochrogaster</i>	Open prairies, fence rows, r.r. rights-of-way and old cemetaries feeding, but appears in various land habitats not restricted	Possibly present
Coyote <i>Canis latroms</i>	Prairies, open woodlands brushy or boulder strewn areas	Not common-might be present
Red fox <i>Vulpes fulva</i>	Mixture of forest & open country preferred	Common-present
Gray fox <i>Urocyon cinereoargenteus</i>	Chaparral, open forests & rimrock country	Fairly common-probably present
Raccoon <i>Procyn lotor</i>	Along streams & lakes borders, near wooded areas or rock cliffs	Common-definitely present
Longtail Weasel <i>Mustela frenata</i>	Not restricted-near water	Not uncommon-probably present
Mink <i>Mustela vision</i>	Along streams & lakes	Common-present
Striped skunk <i>Mephitis mephitis</i>	Semi-open country, mixed woods, open prairie, & brush land preferred.	Common-definitely present
White tail deer <i>Odocoileous virginianus</i>	Forest, swamp & open brushy areas nearby	Definitely present

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

Common Loon - Migrant - Rare

Red-throated Loon - Migrant - Rare

GREBES

Horned - Migrant - Rare

Pied Billed - Resident & Migrant - Common

Double Breasted Cormorant - Migrant - Very Rare

HERONS

Great Blue - Summer Resident & Migrant - Common

Egrets

American - Summer Resident & Migrant - Rare

Green - Summer Resident - Common

Black-crowned Night - Migrant - Rare

BITTERNS

American - Migrant - Rare

Least - Migrant & Summer Resident in marshes - Rare due to lack of habitat

GEESE

Canada - Migrant - Common high fliers

Snow - Migrant - Uncommon

Blue - Migrant - Uncommon

DUCKS

Mallard - Migrant & Winter Resident - Common

Black - Migrant & Winter Resident - Common

Gadwall - Migrant - Uncommon

Baldpate - Migrant - Uncommon

Pintail - Migrant - Uncommon

Green-winged Teal - Migrant - Uncommon

Blue-winged Teal - Migrant - Uncommon

Shoveller - Migrant - Uncommon

Wood - Summer Resident & Migrant - Common

Redhead - Migrant - Rare

Ring-Necked - Migrant - Common

Canvas-back - Migrant - Rare

Lesser Scaup - Migrant - Common

American Golden-eye - Migrant & Winter Resident - Common

Buffle-head - Migrant - Uncommon

Old-squaw - Accidental Migrant

White-winged Scoter - Accidental Migrant

Ruddy - Migrant - Uncommon

Hooded Merganser - Migrant - Uncommon

American Merganser - Migrant - Uncommon

Red-breasted Merganser - Migrant - Uncommon

Turkey Vulture - Resident - Common

Black Vulture - Summer Resident - Uncommon

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

HAWKS

Sharp-shinned - Resident - Uncommon
Cooper's - Resident - Uncommon
Red-tailed - Resident - Common
Red-shouldered - Resident - Common
Broad-winged - Summer Resident - Uncommon
Rough-legged - Winter Resident - Uncommon & Rare
Bald Eagle - Winter Visitor - Very Rare
Marsh - Resident & Migrant - Uncommon
Osprey - Migrant - Rare
Duck - Accidental & Migrant - Endangered
Pigeon - Migrant - Rare

Bob-white - Resident - Common

Sandhill Crane - Migrant - Rare

RAILS

King - Summer Resident in Marshes - Rare
Virginia - Summer Resident in Marshes - Rare
Sora - Summer Resident in Marshes - Rare

Florida Gallinule - Summer Resident & Migrant in marshes - Rare
Coot - Migrant - Parks & Lakes - Uncommon

PLOVERS

Piping - Migrant - Rare
Semipalmated - Migrant - Rare
Killdeer - Resident - Common
Golden - Migrant - Uncommon
Black-bellied - Migrant - Uncommon

Ruddy Turnstone - Migrant - Rare
Woodcock - Summer Resident - Common - Wet Woodland
Wilson's Snipe - Migrant - Marshes - Rare
Upland Plover - Migrant - Rare
Spotted Sandpiper - Summer Resident - Common
Solitary Sandpiper - Migrant - Uncommon to Common
Greater Yellowlegs - Migrant - Marshes - Rare
Lesser Yellowlegs - Migrant - Marshes - Rare
Pectoral Sandpiper - Migrant - Wet fields - Uncommon
Least Sandpiper - Migrant - Uncommon
Dowitcher - Migrant - Rare
Stilt Sandpiper - Migrant - Very Rare
Sanderling - Migrant - Very Rare

GULLS

Herring - Migrant - Uncommon
Ring-billed - Migrant - Uncommon
Bonaparte's - Migrant - Rare

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

TERNS

Foster's - Migrant - Very Rare in Area
Common - Migrant - Rare
Caspian - Migrant - Very Rare
Black - Migrant - Very Rare
Mourning Dove - Resident - Common
Yellow-billed Cuckoo - Summer Resident - Common
Black-billed Cuckoo - Summer Resident - Common

OWLS

Barn - Resident - Uncommon - Woods
Screech - Resident - Uncommon - Woods
Great Horned - Resident - Common Creek bottom Woodlands
Barred - Resident - Common Creek bottom Woodlands
Long-eared - Winter Resident - Uncommon - Woods
Short-eared - Winter Resident - Uncommon - Woods
Whip-poor-will - Summer Resident - Common - Woods
Nighthawk - Summer Resident & Migrant - Common - Woods
Chimney Swift - Summer Resident - Common
Rubythroated Hummingbird - Summer Resident - Common
Belted Kingfisher - Summer Resident - Common

WOODPECKERS

Flicker - Resident - Common - Woods
Pileated - Resident - Rare - Woods
Red-bellied - Resident - Uncommon - Woods
Red-headed - Resident - Common
Yellow-bellied Sapsucker - Winter Resident - Uncommon
Hairy - Resident - Uncommon
Downy - Resident - Common

FLYCATCHERS

Kingbird - Summer Resident - Common
Crested - Summer Resident - Common - Woods
Phoebe - Summer Resident - Common
Arcadian - Summer Resident - Common
Alder - Summer Resident - Uncommon - Moist Woods
Least - Migrant - Common
Wood Pewee - Summer Resident - Common - Woods
Olive-sided - Migrant - Rare

SWALLOWS

Tree - Migrant - Uncommon
Banks - Summer Resident - Uncommon
Rough-winged - Summer Resident - Uncommon
Barn - Summer Resident - Common
Cliff - Migrant - Uncommon
Purple Martin - Summer Resident - Common
Blue Jay - Resident - Common - Woods & Shrubs
Crow - Resident - Common
Black-capped Chickadee - Resident & Migrant - Common
Carolina Chickadee - Resident - Common

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

Tufted Titmouse - Resident - Common

White-Breasted Nuthatch - Summer Resident - Uncommon - Woods

Red-breasted Nuthatch - Winter Resident - Rare

Brown Creeper - Winter Resident - Common

WRENS

House - Summer Resident - Common

Winter - Winter Resident - Rare

Bewick's - Summer Visitor - Rare

Carolina - Resident - Common

Long-billed Marsh - Migrant - Rare

Short-billed Marsh - Migrant - Rare

Mockingbird - Resident - Common

Catbird - Summer Resident - Common

Brown Thrasher - Summer Resident - Common

THRUSHES

Robin - Resident - Common

Wood - Summer Resident - Common - Woods & Shrubs

Hermit - Migrant - Common

Olive-backed - Migrant - Uncommon

Gray checked - Migrant - Rare

Veery - Migrant - Uncommon

Bluebird - Resident - Uncommon

Blue-gray Gnatcatcher - Summer Resident - Common

Golden-crowned Kinglet - Migrant - Rare - Conifers

Ruby-crowned Kinglet - Winter Resident - Uncommon

Cedar Waxwing - Resident - Common

Migrant Shrike - Resident - Uncommon

Starling - Resident - Common

VIREOS

White-eyed - Summer Resident - Uncommon

Bell's - Summer Resident - Rare

Yellow-throated - Summer Resident - Uncommon

Blue-headed

Red-eyed - Summer Resident - Common

Philadelphia - Migrant - Uncommon

Warbling - Summer Resident - Common

WARBLERS

Black and White - Summer Resident - Common - Woods

Prothonotary - Summer Resident - Uncommon - Streams

Worm-eating - Summer Resident - Rare

Golden-winged - Migrant - Rare

Blue-winged - Migrant - Uncommon

Tennessee - Migrant - Common

Orange-crowned - Migrant - Rare

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

WARBLERS

Nashville - Migrant - Common
Parula - Summer Resident - Uncommon
Yellow - Summer Resident - Common
Magnolia - Migrant - Common
Cape May - Migrant - Rare
Black-throated Blue - Migrant-Rare
Myrtle - Migrant - Common
Black-throated Green - Migrant-Common
Cerulean - Summer Resident - Common - Creek Bottoms
Blackburnian - Migrant - Common
Yellow-throated(Sycamore) - Summer Resident - Uncommon - Creek Woods
Chestnut-sided - Migrant - Common
Bay-breasted - Migrant - Common
Black-poll - Migrant - Common
Pine - Migrant - Rare
Prairie - Summer Resident - Rare - Woods edges
Palm - Migrant - Common
Oven-bird - Summer Resident - Common - Woods
Northern Water thrush - Migrant - Rare
Louisiana Water thrush - Summer Resident - Common - Rivers & Creeks
Kentucky - Summer Resident - Common - Wet woods
Connecticut - Migrant Rare
Mourning - Migrant - Rare
Yellow-throat - Summer Resident - Common
Yellow-breasted Chat - Summer Resident - Uncommon - Thickets
Hooded - Migrant - Rare
Wilson's - Migrant - Rare
Canada - Migrant - Uncommon
Redstart - Migrant - Common - Woods
English Sparrow - Resident - Very common
Bobolink - Migrant - Uncommon
E. Meadowlark - Resident - Common
W. Meadowlark - Resident - Uncommon
Red-wing - Resident - Common
Orchard Oriole - Summer Resident - Uncommon
Baltimore Oriole - Summer Resident - Uncommon - Trees
Rusty Blackbird - Migrant - Uncommon
Grackle - Resident - Common
Cowbird - Summer Resident - Common
Scarlet Tanager - Summer Resident - Uncommon - Woods
Summer Tanager - Summer Resident - Common - Stream Trees
Cardinal - Resident - Common

Rose-breasted Grosbeak - Migrant - Uncommon

Indigo Bunting - Summer Resident - Common - Wood edges

Purple Finch - Winter Resident - Uncommon - Open woods
Goldfinch - Resident - Common
Towhee - Resident - Common

BIRDS OF ANDERSON RIVER WATERSHED & VICINITY

SPARROWS

Savannah - Migrant - Uncommon
Grasshopper - Summer Resident - Uncommon
Henslow's - Summer Resident - Uncommon
Vesper - Winter Resident - Uncommon
Lark - Migrant - Rare
Bachman's - Summer Resident - Rare
Slat-colored Junco - Winter Resident - Common - Wood edges
Tree - Winter Resident - Common
Chipping - Summer Resident - Common
Field - Resident - Common
White-crowned - Migrant - Common
White-throated - Migrant - Common - Dense undergrowth
Fox - Winter Resident & Migrant - Uncommon
Lincoln's - Migrant - Rare
Swamp - Winter Resident - Rare in area
Song - Resident - Common - Bush
Lapland Longspur - Winter visitor - Uncommon

Snow Bunting - Winter visitor - Uncommon

APPENDIX D





DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

15 APR 1975

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Control No.

06 - 93943 J

Referred to: SCS

Date: _____

B APR 2 1975

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist, by letter dated 5 February 1975, requested the views of the Secretary of the Army on the Watershed Work Plan and Draft Environmental Statement for Anderson River Watershed, Indiana.

We have reviewed the work plan and foresee no conflicts with any projects or current proposals of this Department. Other comments on the content of the report, and certain items suggested for your further consideration in continuation of planning for and design of the proposed improvements, are listed on the attached sheets.

We have reviewed the draft environmental statement. There are several subjects which seemingly are deserving of further coverage. These too are listed for your consideration on the attachment.

Sincerely,

A handwritten signature in cursive ink that reads "Charles R. Ford".

1 Incl (dupl)
As stated

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)

REVIEW COMMENTS (ARMY)
ANDERSON RIVER WATERSHED WORK PLAN & DEIS (SCS)

Work Plan

1. General. The report mentions coal reserves and strip mine damage. However there does not appear to be any mention of reclaiming the strip mine land areas. It cannot be determined from the report whether or not this is a problem, but consideration should be given to covering this feature.

2. Page 37 - Projects of Other Agencies. A number of revisions in the information on Patoka Lake are recommended:

a. First line: "Patoka Lake, a reservoir of nearly 9,000 acres (seasonal pool)..."

b. Fifth line: "The seasonal (water supply) pool of the lake..."

c. Sixth line: "...a point approximately 3 miles west..."

d. Eight and ninth lines: "Approximately 6,000 acres of land will be acquired specifically for..."

3. Page 57. In developing the design of the drop inlet spillways, it is suggested that reference be made to model studies conducted by Mr. Charles A. Donnelly, Hydraulic Engineer with the U. S. Department of Agriculture, Agricultural Research Service, Soil and Water Conservation Research Division, St. Anthony Falls Hydraulic Laboratory, in Minneapolis, Minnesota. Mr. Donnelly developed generalized criteria for two-way uncontrolled drop inlets for closed conduit spillways. The results of these studies were published in the Journal of Soil and Water Conservation, Volume 20, Number 6, November-December 1965, entitled "The Two-way Drop Inlet for Closed Conduit Spillways."

4. Page 84, 1st para. The use of \$2.25 as the recreation unit day value to compute recreation benefits for structures Nos. U-1 and U-10 is questionable. Recreation unit values of \$1.00 to \$1.50 were used to estimate recreation benefits for Patoka Lake (currently under construction) which lies just north of the Anderson Watershed. The recreation-unit value used to compute recreation benefits is considered significant due to the fact that recreation benefits account for 68% of the primary benefits for the recommended plan.

5. Page 155 and 156, Figures 1 and 2:

a. Unless the design flow of the spillways is entrenched in unweathered hard rock, it is suggested the spillways be located further away from the dam as spillway flows could erode through weathered rock or overburden and endanger the dam.

b. It appears that a continuous vertical sand drain should be constructed just downstream of the core to intercept seepage through the fill. The vertical drain should be connected to the foundation trench drains.

c. Bedrock openings under the entire embankment fill should be sealed with sanded grout to prevent piping of overburden and/or fill into the bedrock. A grout curtain should be provided where bedrock is exposed in the valley bottom and abutments.

REVIEW COMMENTS (ARMY) (CONT'D)

d. The dam cross section does not show what slopes are proposed. By scale, the slope is 2-1/4 H to IV. This is too steep for mowing. Mechanical equipment slips on such a slope and starts rutting and bare spots. The slope should be 1 on 2-3/4 to 1 on 3 as a minimum.

e. The need for riprap on the upstream slope should be considered for the single purpose structures.

6. Pages 158-163. The fluctuations of the 100-year profile alternately either side the 1959 flood, by several feet, appear reflective of some inconsistencies in basic assumptions for the backwater computations. The impact on study findings may or may not be significant.

DEIS

1. Coordination with other Federal, state and local agencies, organized groups and citizens seems incomplete. Several agencies, including the U.S. Department of Housing and Urban Development at Indianapolis, Ohio River Basin Commission, and Federal Energy Administration, were omitted from the coordination list. Dr. James H. Kellar, Indiana State Archeologist, and Mr. Joseph D. Cloud, the Indiana Historical Preservation Officer, should be added to the state agency list. Coordination with Mr. Cloud appears desirable due to the reported existence of an old grist mill adjacent to Mitchell Creek. It is noted on page 16 that this mill would be in the permanent pool of structure No. U-1. News agencies were also omitted from the coordination list. Addition of newspapers would be of benefit to the public as this presents them an opportunity to voice their interest or disagreement with the project. Key groups active in Indiana such as Sierra Club, Audubon Society, Izaak Walton League, Indiana Eco-Coalition and others need to be given the opportunity to review and comment on the EIS.

2. It is unclear how benefits are justified for water supply (see page 4). No need for additional water supply is expressed until 1985 and that appears speculative.

3. The EIS indicates on pages 25 and 26 that oil and gas are produced in small quantities and that exploration activities in Southern Indiana are on the increase. Recent production figures could be added here. Will the increased production have any effect on the water quality or the proposed structure?

4. Since most of Perry County's coal reserve lie within the watershed and coal is also present in Crawford, Spencer and Dubois Counties, will construction and operation of the proposed plan restrict removal of the coal and if so to what extent?

5. The watershed is primarily an agricultural area. Consideration should be given to net losses and net gains to agricultural productivity.

6. The Plant and Animal Resources section appears deficient in some areas. For example, there is no discussion or listing of principal or unusual plant and stream species (fish, arthropods, etc.). An evaluation cannot be made by the reviewer if the base information is lacking. As a matter of note, there is no discussion of the specifically expected effects of impoundment on the aquatic

REVIEW COMMENTS (ARMY) (CONT'D)

biota above, below or within the project area. The authority for each designation of rare/endangered species should be cited and the criteria for such designation described if the discussion is to be retained. The advisability of retention is questioned as the referenced species are not placed within the sphere of project impact. It is also questioned whether a correlation should be made between the woodrat and karst topography (see p. 37) as that topography is not the determining factor in the presence of the species. The species list located in Appendix C should be source referenced.

7. The surveying and, if necessary, testing of all construction sites and their immediate surroundings by a qualified archeologist should probably be accomplished before construction is begun.

8. With respect to the description of projects of other agencies (page 43) see Work Plan comment 2, above.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

Mr. Cletus J. Gillman
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
5610 Crawfordsville Road, Suite 2200
Indianapolis, Indiana 56224

MAY 6 1975

Dear Mr. Gillman:

We have reviewed the Draft Environmental Impact Statement (EIS) dated February 5, 1975 for the Anderson River Watershed, Indiana. We have classified our comments as Category LO-2. Specifically, this means we have no objections to the project but we believe additional information should be provided in the EIS to adequately assess the environmental impacts. The classification and date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on major Federal actions. We offer the following comments for your use in preparing the Final EIS.

The project will provide water supply for the Archabbey and the Town of Birdseye. The location and environmental impacts of the transmission systems as well as the water intakes should be described. Also, plans for livestock watering areas at reservoir L-24 seem incompatible with its proposed water supply use. Off-site watering should be provided.

The EIS should expand its discussion of water quality. Possible problems resulting from increased water temperatures within the impoundments should be addressed. More information should be provided on the description and related environmental impacts of sanitary waste disposal systems at recreation areas. The two largest impoundments - Structures U-1 and U-10 with surface areas of 654 and 152 acres respectively, are located on watersheds that are predominantly forested. Water quality problems should not develop as a result of nutrient buildup from upstream sources. However, sanitary facilities for recreation use at these impoundments will cause an increase in organic and nutrient materials. The discharge from these facilities should be below the dam at each structure.

Clearing, grubbing and construction of dams for the impoundments will result in an increase of suspended materials. Silt retention dams should be constructed to control siltation from these activities.

The project will stabilize approximately 100 acres of abandoned strip-mined land. A description of the vegetative and structural measures should be included in the EIS.

Slightly less than fifty percent of the eight hundred or more farms in the watershed have entered into voluntary agreements with the soil conservation districts. Inasmuch as the conservation treatment of all the watershed farm lands is essential to reduce erosion and run-off to acceptable levels and to minimize siltation of the proposed impoundments there should be a proposal in the EIS as to how the half of the non-cooperating farms will be reached with this program and the alternatives that will be pursued if this cooperation is not forthcoming. This latter point poses considerable difficulty because the benefits are not spread equitably throughout the Anderson River basin. Since a breakdown of the cooperators by upland and floodplain farmers is not provided, it must be assumed that land treatment practices other than drainage practices, are being implemented to a large degree by floodplain farmers. The limited success of this program throughout the watershed is indicative of the lack of perceived benefits for upland farmers. It is unrealistic to expect the owner of the upland farm to engage in conservation measures for the enhancement of a downstream landowner's property. Granted, the upland landowner would gain in the long term, but it would not be as great in amount nor would it be as timely. This contention is supported by the table of Land Treatment measures (P.42) and the imbalance of applied drainage practices to soil conserving practices. If the motivation was stronger for economic return from the soil conserving practices vs. drainage measures, it would be indicated in the balance of the practices applied.

In this same vein, the EIS should elaborate further on the relationship between the Soil Conservation Service, the Soil Conservation Districts and the individual cooperators through whom the land treatment practices will be applied. Inasmuch as the relationship between the Soil Conservation District and the cooperators is voluntary there remains a question as to how the district could deal with the cooperators failure to carry out planned land treatment measures or deal with changes in ownership and resulting failure to get land treatment measures applied upstream of proposed impoundment sites. This entire issue deals with the success or failure of the project and the protection of the Federal investment.

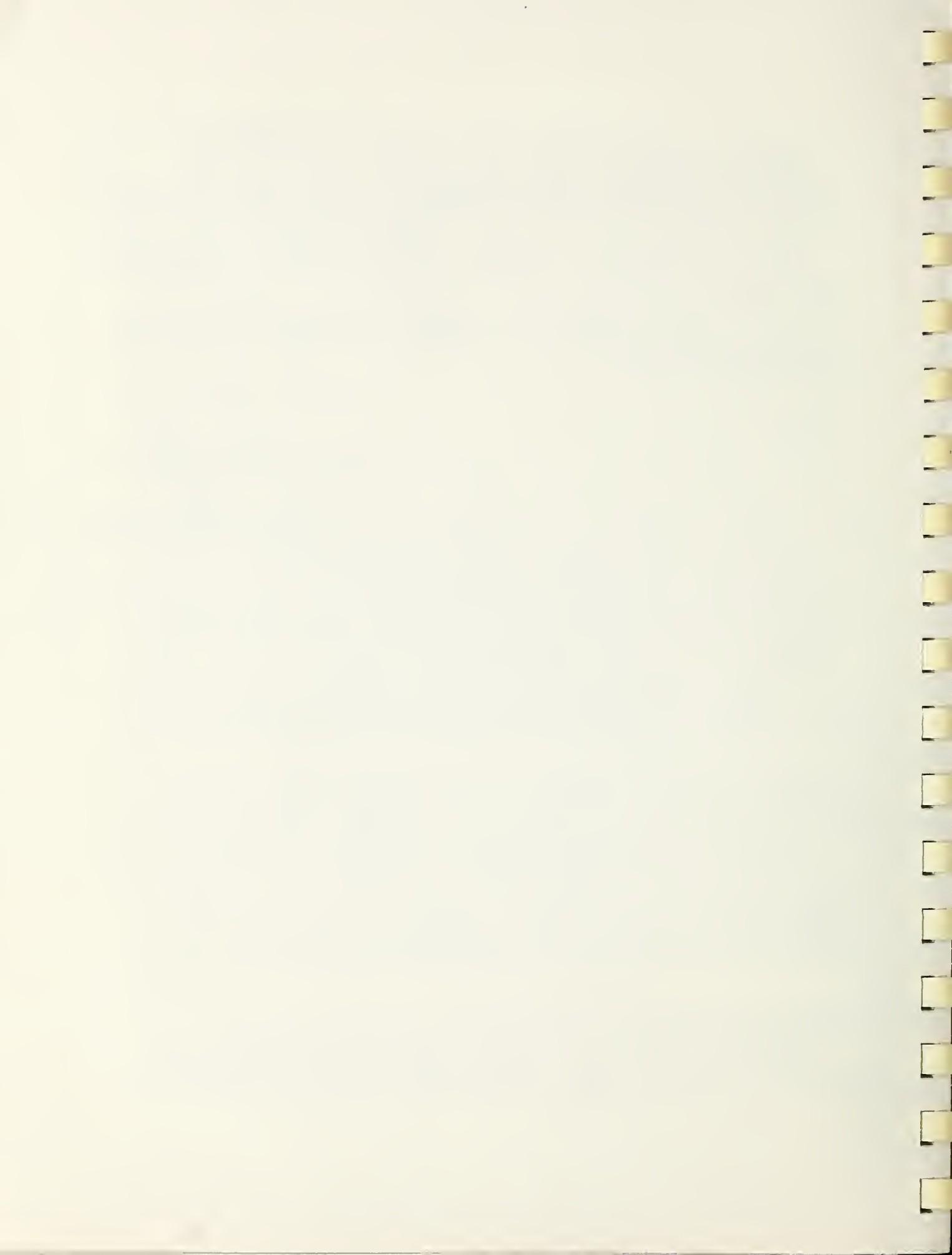
It is indicated that none of the four counties affected by this project have developed land use plans. The EIS should discuss the potential problems including the secondary impacts of providing significant recreational development in an area that lacks adequate land use controls.

In addition, the EIS should address the effects of flood protection on inducing landowners to clear the floodplain of trees for more intensive cultivation. Also, the land use of the areas subject to floodplain scour should be indicated together with the degree of assurance that incompatible land uses will be prescribed on these soils. In view of the limited success of the land treatment program for soil erosion control on upland soils, the Draft EIS should discuss the consequences of this trend as it would effect the achievement of project goals.

We appreciate the opportunity to review this Draft EIS. Please send us two copies of the Final EIS when it is filed with the Council on Environmental Quality.

Sincerely yours,


Donald A. Wallgren
Chief,
Federal Activities Branch





United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
PEP 75/139

APR 29 1975

Dear Mr. Gillman:

Thank you for your letter of February 5, 1975, requesting our views and comments on the draft environmental impact statement and work plan for the Anderson River Watershed, DuBois, Perry, Spencer and Crawford Counties, Indiana. Our comments are presented below.

Work Plan

This work plan does not respond satisfactorily to several concerns which the Department's Fish and Wildlife Service has repeatedly stressed in correspondence since 1972. Foremost among these concerns is the problem of specific designation of lands for wildlife mitigation purposes. The present document provides only a general discussion on locations and proposed management practices on such lands. The Fish and Wildlife Service requested and continues to request specific acreage and locations of such lands so that it can judge whether they will effectively mitigate project-caused adverse impacts on wildlife resources. Further, we disagree with the exceptions on pages 62 and 63 which would allow grazing and haying in flood easement areas where such practices presently occur. We do not believe that flood easement areas can be considered mitigation lands if these uses are allowed to continue. Either the easement lands should be set aside as wildlife mitigation lands only or additional mitigation lands must be found.

Another of our unanswered concerns relates to the fact that environmentally protective measures are not guaranteed prior to construction activities. It is possible that the contractors could make onsite decisions contrary to the planning agreements resulting in more environmental destruction than was anticipated. We recommend that the work plan discussion



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on channel work and mitigation contain specific language to prevent such a possibility.

Abbreviated Environmental Quality Plan

The second paragraph on page 4, states that spring flooding often results in the loss of a complete year of a species of ground nesting birds and animals. Unless the animal is limited in its distribution to the project flood plain, any particular year's brood or age class will be represented in other localities. Perhaps this statement could be revised to indicate that occasionally a brood year of a species within a specific geographic area could be adversely impacted, and, in unusual circumstances, completely eliminated by flooding. This comment also applies to the first paragraph on page 32 of the Work Plan.

The kinds and general location of trees to be planted in the reforestation program should be described.

The section on Recreation, page 4, should mention nearby Forest Service recreation area reservoirs of Middle Fork of Anderson River Watershed and associated recreation; Ferdinand State Forest and the Patoka Reservoir currently under construction by the U.S. Army Corps of Engineers. An additional statement should be included to explain why additional recreation provided by the proposed project is needed. Non-water based recreational opportunities also should be mentioned.

Under Federal Programs, item 1d on page 11 is in error and misplaced. It should be placed under the U.S. Department of the Interior as item 2c, and the suggested wording is as follows:

- c. Land and Water Conservation Fund - Provides for (1) acquisition of lands for Federally administered recreation areas and (2) matching grants for State recreation planning and State as well as local land acquisition and development. Administered by the Bureau of Outdoor Recreation.

At the bottom of page 11 we believe the Bureau of Outdoor Recreation should also be listed under number 6 as an agency which will provide technical assistance.

Watershed Resources

The section on Plant and Animal Resources, pages 17-19, should include quantitative data of pre-project hunting and fisherman use. This should be broken down by project area (e.g., channel, multi-purpose reservoirs) and include man days use, and total harvest estimates for common game fish, small game, big game and waterfowl.

Any furbearer trapping that takes place in the watershed should be mentioned. Mink, muskrat, and raccoon tracks have been observed in the project area.

Information on general types and relative abundance of passerine birds, hawks, owls, and vultures should also be included in this section.

Project Formulation

Discussion should include what measures have been taken, if any, to safeguard upstream water quality for structures U-1 and U-10. Since life expectancy of the reservoirs and their use for recreation and by fish and wildlife is dependent upon the present good water quality of the upper Anderson River and Sigler Creek respectively, upper watershed acreage under the control of the Forest Service, Indiana Department of Natural Resources and other county governments should be indicated. Potential future uses of the reservoir watershed for mining, logging and other activities that may affect water quality adversely also should be discussed.

We recommend that power boating not be allowed in the upper reaches of the multi-purpose reservoirs and also that a boating use density plan be implemented upon completion of these reservoirs. Carrying capacity guidelines as used in the Indiana Department of Natural Resources' "State Outdoor Recreation Plan" would help insure that water quality will remain adequate in the multi-purpose reservoirs.

The discussion on channel work should contain specific language to insure contractor adherence to construction practices which will minimize environmental damage. We suggest the following examples:

"Debris blocks will be removed with the least possible disturbance to trees and vegetation adjacent to the channel bank and to the earth of the channel bottom

and banks . . . Debris entirely below normal water line will not be removed . . . Equipment to be used for debris or bar removal will not be allowed in the stream, except floating types. Ingress and egress to each work area will be accomplished without traveling within the channel and without destruction of woody habitat within 20 feet of the channel bank . . . The work area will be only as large as required and any clearing done will preserve desirable trees and not destroy the canopy . . . The contractor will be thoroughly briefed concerning work procedures that are necessary to protect the stream and the involved natural resources."

On page 43, the ". . . third project goal is to establish and improve wildlife habitat while minimizing habitat losses . . ." A distinction should thus be made between mitigation lands for fish and wildlife and enhancement lands.

We recommend that single purpose reservoirs on public land be open to fishing only to avoid compromising this use with other conflicting forms of recreation.

Works of Improvement to be Installed

The section, Reservoir Type Structures, pages 57-64, should specify that the U.S. Fish and Wildlife Service, U.S. Forest Service, and Indiana Department of Natural Resources will review the clearing plans for Structures U-1 and U-10. These agencies also should assist the U.S. Soil Conservation Service in evaluating the impact of any project-related borrow areas outside the structures.

The net effect the works of improvement will have in mitigation project-caused adverse impacts on wildlife resources is best demonstrated by pre- and post-project evaluations. The Work Plan should indicate what evaluations are contemplated to determine the effectiveness of planned wildlife mitigation measures.

It is stated on page 63 that sufficient mitigation lands are available for Structures U-1 and U-10 within the purchase

boundaries, but no acreages or possible locations are provided. The acres to be affected by reservoir development are known, so the acres needed for mitigation also should be known and identified in the Work Plan. Since the additional lands purchased are primarily for general recreation, wildlife use of much of the area will be discouraged by large numbers of people. Low intensity use areas need to be provided and managed for wildlife. We hope such areas will be provided for in the fish and wildlife management plans and that information will appear in the final Work Plan. We recommend that mitigation lands be purchased upstream from Structures U-1 and U-10 in order to provide wildlife habitat and protect water quality in the reservoirs.

Although it is not mentioned in the section on Channels, pages 64-65, it is our understanding that only those trees marked during the multi-agency tour will be removed from the channel area. The reference on page 64 to "mechanical stabilization" of bank erosion areas by shaping and riprapping is ambiguous. Although it was understood that channel work would not consist of extensive excavation and tree clearing, a detailed description of what actually will take place should be included in the Work Plan. Our previous comments requesting specific language on construction procedures also apply here.

Nature trails and low intensity public use wildlife areas also should be provided in the public recreation lands, pages 65-66, since some part of the land purchased is to serve as mitigation for wildlife habitat as indicated on page 48. This recommendation should be forwarded to the agencies developing the recreation areas.

Effects of Works of Improvements

In the third paragraph on page 80, the final sentence concerning stabilization of stream bank erosion needs further elaboration, especially the term "mechanical treatment."

Although there may be no major "land use" changes in the flood pools, there will be changes in the forest stand composition in wooded areas subject to periodic flooding. These changes such as invasion of willows, alders, and sycamores should be addressed in this section.

The secondary effects of this proposed project need to be discussed. Currently, no mention is made concerning development of homes, recreation cabins, and other facilities which

inevitably spring up around man-made impoundments and can result in loss of open space, sewage problems, increased traffic, air pollution, and general degradation of the natural environment.

Investigation and Analyses

Coal, oil and gas, and stone are currently being produced in the project area. Paragraph 2, page 140 of the Work Plan states that "several coal mines exist within the reaches of the watershed. Coal maps published by the Indiana Geological Survey indicated that shaft mines, strip mines or drift mines are located near the proposed structures sites." It further states that "none of these sites would be adversely affected." Does "not adversely affected" mean current mining will be able to continue unhampered? The plan should also indicate whether or not future mining could be restricted. We suggest that the coal maps indicated above be included in the plan as well as any detailed information the Indiana Department of Natural Resources can supply that would adequately and visually show the extent of the coalbeds.

The documents also discuss the presence of oil and gas in the watershed area. Paragraph 3, page 140, of the Work Plan states that "Several abandoned oil and gas wells are located in or near the pool areas of Structures U-1, U-10, L-24, L-29, L-32, L-40, L-51, L-54 and L-56." We believe an explanation of "several" is appropriate here in that nine structures are involved. By "several," do the project proponents mean several wells near each structure? The next sentence states that "most of them are dry." We believe the actual number of dry versus producing wells is necessary. In view of the fact that the permanent water pools created by Structures U-1 and U-10 alone have a surface area greater than 800 acres, a map of the project area locating the wells with respect to the structures and pools should be included.

Paragraph 2, page 141 of the Work Plan states that "A small oil well is located 300-400 feet below planned Structure No. L-59 and that this small well should present no structural stability of water contamination problems at this site." However, what is not stated is whether this well is currently producing and whether the well would have to be closed as a result of the proposed structures.

On page 151 of the Work Plan, third line, fourth paragraph, "fecal streptococci" should read "fecal bacteria."

Draft Environmental StatementPlanned Project

Provisions for wildlife mitigation lands should be included in the minimum land rights requirements for Structures U-1 and U-10 as discussed on page 11.

From the discussion on mitigation on page 15, it appears that flood easement areas of the single purpose structures and multi-purpose Structure L-24 will be set aside and marked as mitigation lands with pasturing and haying to continue if these uses are currently taking place. We do not believe such practices are compatible with managing these lands for wildlife habitat purposes.

Although it was understood that channel work would not consist of extensive excavation and tree clearing, a detailed analysis of what actually will take place is needed on page 16.

Are the land rights referred to on page 17 temporary or permanent easements? Is the channel to be fenced along permanent and temporary pasture areas through the 10.5-mile reach where project construction will take place?

The section on public recreation facilities also should include information on nature trails and other low intensity public use wildlife areas. The actual relationship of the new facilities to current public use opportunities in the adjacent Federal and State Forest should be discussed.

Environmental Setting

The discussion on Federal and State holdings on page 31 should indicate whether the proposed project land acquisition areas for Structures U-1 and U-10 will be contiguous with Federal and State holdings. Explicit descriptions of the ownership of lands in the upper watershed of Anderson River upstream from Structure U-1 and in the upper watershed of Sigler Creek upstream from Structure U-10 is needed to properly evaluate the effect of possible upstream mining, logging, and development upon reservoir water quality.

The section on plant and animal resources, pages 35-37, should include quantitative data of pre-project hunting, fishing, and trapping. This should be broken down by project area (e.g.,

channel, multi-purpose reservoirs) and include man days use, and total harvest estimates for game fish, small game, big game, and waterfowl.

No direct evidence is presented that the project area has been examined by competent professionals to determine whether or not significant cultural resources exist within the watershed.

The final environmental statement should provide evidence of consultation with the State Historic Preservation Officer (Mr. Joseph D. Cloud, Director, Department of Natural Resources, State of Indiana, 615 State Office Building, Indianapolis, Indiana 42604). We also suggest that Dr. James Kellar of Indiana University, be consulted for a professional archeological reconnaissance survey of all project features in order to locate and assess presently unknown cultural resources.

The final statement should present procedures to be implemented in the event that previously unknown cultural resources are encountered during project development.

Page 54, second and third paragraphs, of the draft statement should be written as follows:

"On the basis of fecal coliform/fecal streptococci ratios, the bacteria in the streams probably result from runoff of superficially deposited animal wastes. Concentrations of fecal bacteria should be reduced during periods of low flow when surface storm flows would be absent."

"It was also determined that nitrate concentrations were higher in waters flowing from the more intensively cultivated bottom lands. Stream waters flowing from upland areas generally contained less than 0.5 mg/l nitrate nitrogen, which should present no water quality problems for the proposed reservoirs controlling drainage areas. Water flowing from the more intensely cultivated bottom lands generally contains enough nitrate-nitrogen to cause enrichment and undesirable biologic growth, particularly if associated with an impoundment. However, no impoundments are planned for the bottom lands of the Anderson River."

The environmental statement fails to mention current or past production of gas and oil in the area. It should note the

number of wells, current production capability, and the location of any wells that would be irrevocably preempted by the project. Further, it should indicate the coal seams present, their range of thicknesses, and their areal extent. A discussion of past and present mining operations should also be included. We suggest that the project proponents include copies of the coal maps published by the Indiana Geological Survey and a detailed map that would pinpoint the location of any gas and oil wells in the project area. Any of these resources preempted by the proposed project should be identified in the Section Irreversible and Irretrievable Commitment of Resources. Furthermore, if any of these resources are preempted, paragraph 3, page 65 of the environmental statement, stating that "It is not anticipated that project measures will affect significantly the recoverability of the watershed's mineral resources." should be revised.

We believe it would be desirable for the first paragraph of the subsection Recreation Resources on page 38 to recognize that the U.S. Forest Service, acting in concert with the Bureau of Outdoor Recreation, is utilizing Land and Water Conservation Fund monies to acquire substantial lands for recreation in the Anderson River Watershed.

On page 43 of the Statement the subsection, Projects of Other Agencies, contains a description of Patoka Reservoir, a U.S. Army Corps of Engineers' project outside the watershed boundary. We believe the Statement and Work Plan should also contain in this subsection, or another if preferred, a similar description of the recreational resources developed in the adjacent Middle Fork of Anderson River Watershed.

Environmental Impacts

The Soil Conservation Service estimates that the basin annually loses 40,000 tons of sediment to the Ohio River, page 62, whereas a U.S. Geological Survey report by L. E. Johnson (1971) estimates that only 18,500 tons would be lost per year. Perhaps part of this difference in estimates is due to the lack of a good data base. The final statement should include the source of the figure used, in order to make proper appraisal of the evaluation of impacts possible. The sediment station located at Middle Fork Anderson at Bristow, Indiana, has a data base extending to 1964, and because of the construction of a reservoir in 1968 should be of assistance in anticipating effects in the basin under consideration.

The estimated amount of fisherman and hunter day use created by the project should be included in this section.

On pages 62-63, multi-level outlets on Structures U-1 and U-10 are mentioned. What facilities, if any, are to be provided to develop a tailwater fishery and public access below these structures, e.g., a plunge basin and bank fishing areas?

Although there may be no major "land use" changes in the flood pools as stated on page 64, there will be changes in the forest stand composition in wooded areas subject to periodic flooding. These changes such as invasion of alders, willows and sycamores should be mentioned in this section.

The secondary effects of this proposed project need to be discussed. Currently, no mention is made concerning development of homes, recreation cabins, and other facilities which inevitably spring up around man-made impoundments and can result in loss of open space, sewage problems, increased traffic, air pollution, and general disruption of the natural environment. In particular, the effect of the proximity of I-64 to proposed Structure U-10 should be fully discussed.

We believe it to be highly desirable that there be a discussion of the manner and degree to which the proposed multiple-purpose recreation structures will compete with or complement the recreational opportunities at Patoka Reservoir and the Middle Fork of Anderson River Watershed developments. As part of this discussion it may be appropriate to indicate whether or not there are any long-range plans to link together all of the above-mentioned recreation resources as well as others, such as German Ridge Recreation Area, Ferdinand State Forest, and Spring Valley State Fish and Wildlife Area, with a network of hiking trails.

Short-Term vs. Long-Term Use of Resources

There should be a more detailed discussion of the long term effect of the project. Will erosion and flooding be controlled after the proposed 49 structures have filled with silt? Will local interests maintain the reservoirs free from excessive silt accumulation?

We hope these comments and suggestions will be of assistance to you.

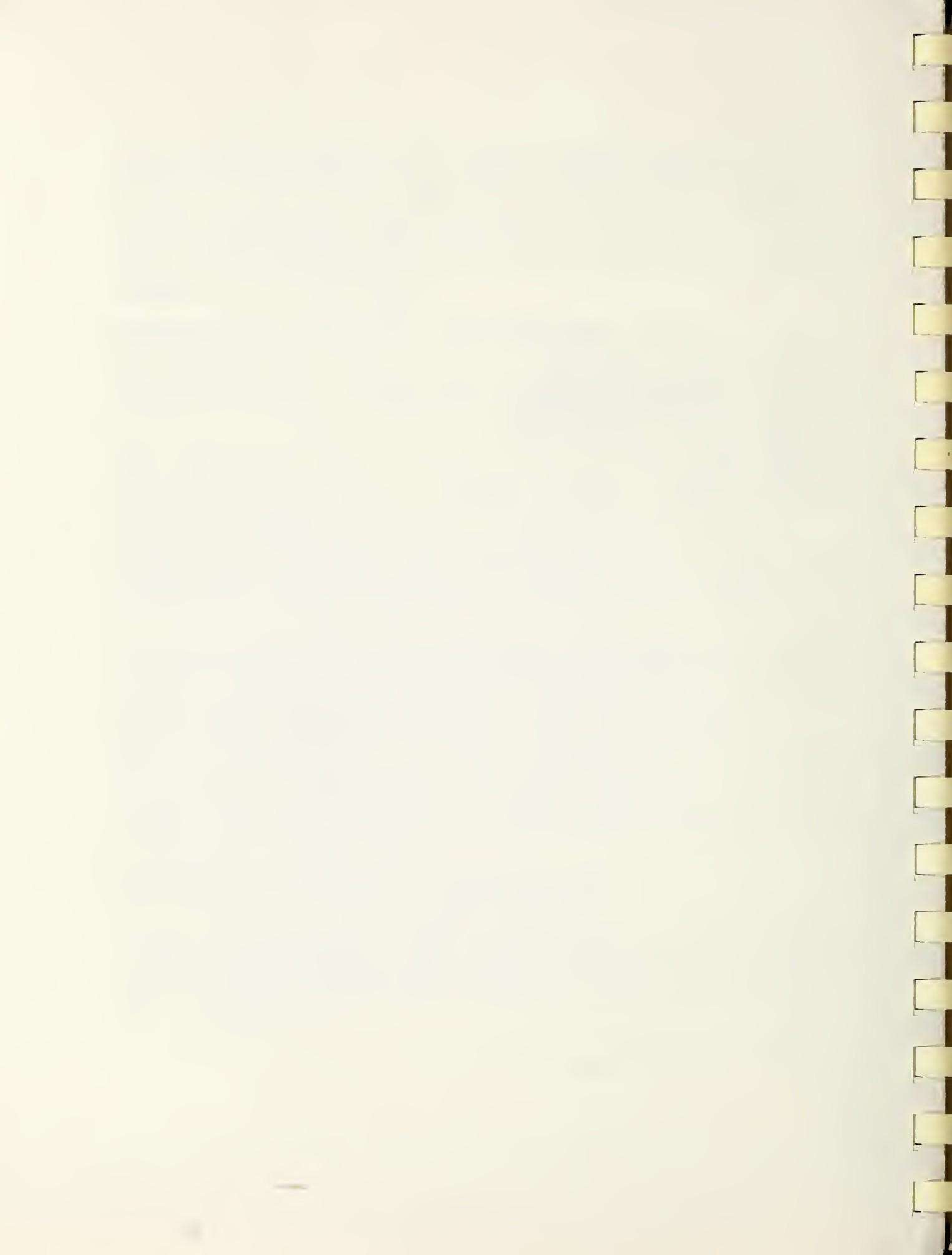
Sincerely yours,



Deputy Assistant

Secretary of the Interior

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
Department of Agriculture
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224



**Advisory Council
On Historic Preservation**
1522 K Street N.W. Suite 430
Washington D.C. 20005

April 3, 1975

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

This is in response to your request of February 5, 1975 for comments on the environmental statement for the Anderson River Watershed, Indiana.

Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural, and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish additional data indicating:

Compliance with Executive Order 11593 "Protection and Enhancement of the Cultural Environment" of May 13, 1971.

In the case of lands not under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will contribute to the preservation and enhancement of non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance. Archeological surveys should be undertaken for areas affected by structural measures, in accordance with Section 800.4(a) of the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

To ensure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain evidence of contact with the appropriate State Historic Preservation Officer and that a copy of his comments con-

cerning the effects of the undertaking upon these resources be included in the environmental statement.

Should you have any questions, please contact Jordan E. Tannenbaum of the Council staff at 202/254-3380.

Sincerely yours,

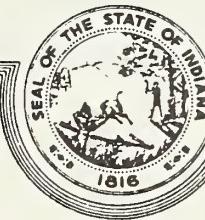


John D. McDermott
Director, Office of Review
and Compliance

STATE - INDIANA

DEPARTMENT OF NATURAL RESOURCES

JOSEPH D. CLOUD
DIRECTOR



INDIANAPOLIS, 46204

March 26, 1975

Mr. Cletus J. Gillman
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

The staff of the Department of Natural Resources has reviewed the Draft Work Plan and the Draft Environmental Impact Statement for the Anderson River Watershed and both documents appear to adequately cover the opportunities associated with this watershed.

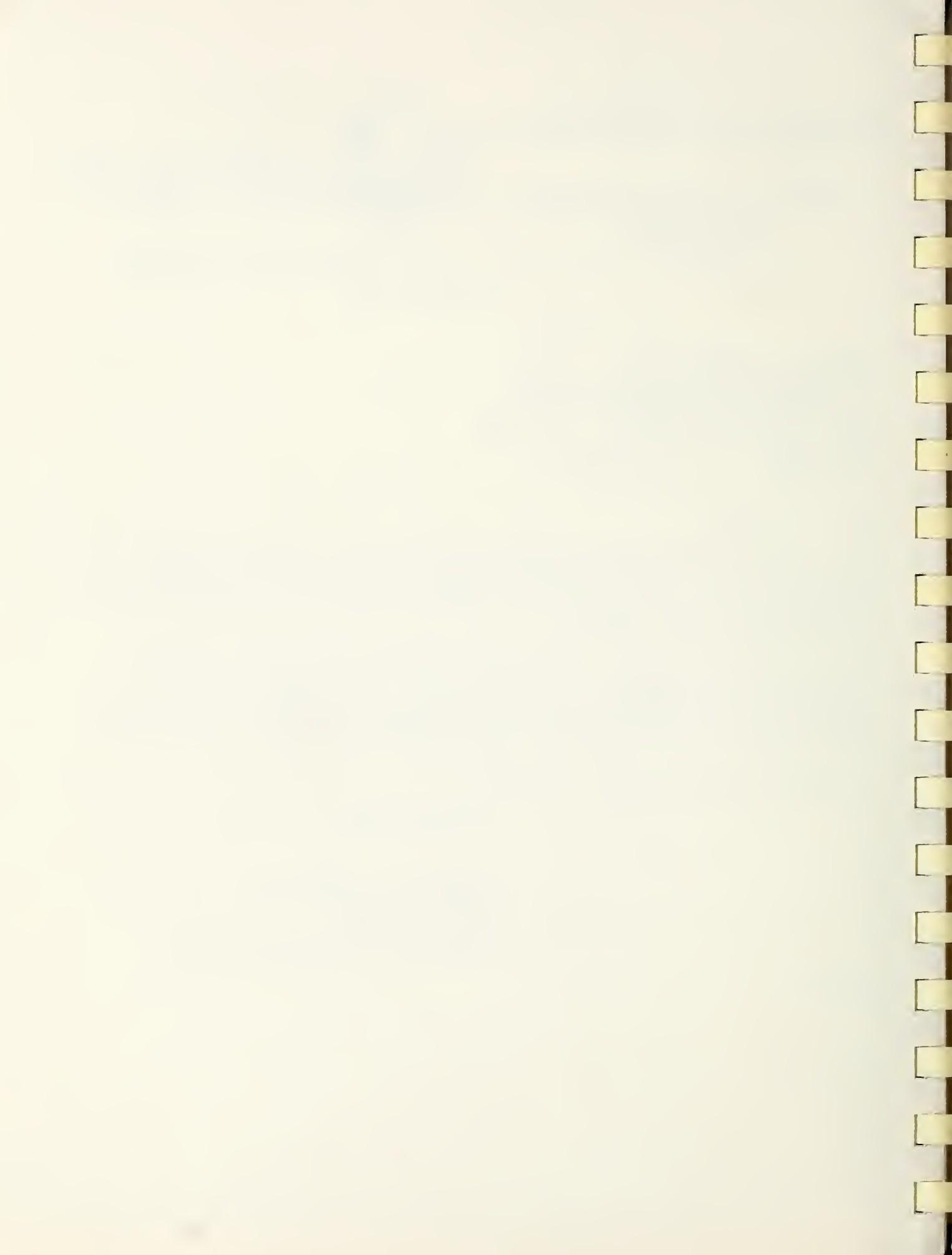
The two major multi-purpose structures involved in this project proposal will assist in fulfilling the existing outdoor recreational activity deficiencies in this particular part of the State, as set forth in the 1975 Indiana Outdoor Recreation Plan, the United States Department of Agriculture Forest Service plan and the local agency plans.

We have no further comments at this time.

Sincerely yours,

William J. Andrews
William J. Andrews
Deputy Director
Department of Natural Resources

WJA:CM:cm



APR 2, 1975



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

MAR 26 1975

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

This is in response to your letter of 5 February 1975 addressed to the Commandant, U. S. Coast Guard concerning a draft environmental impact statement for the Anderson River Watershed, Perry, Spencer, Dubois, and Crawford Counties, Indiana.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard commented as follows:

"The environmental impact statement should include a discussion of planning for small boat safety and boating education."

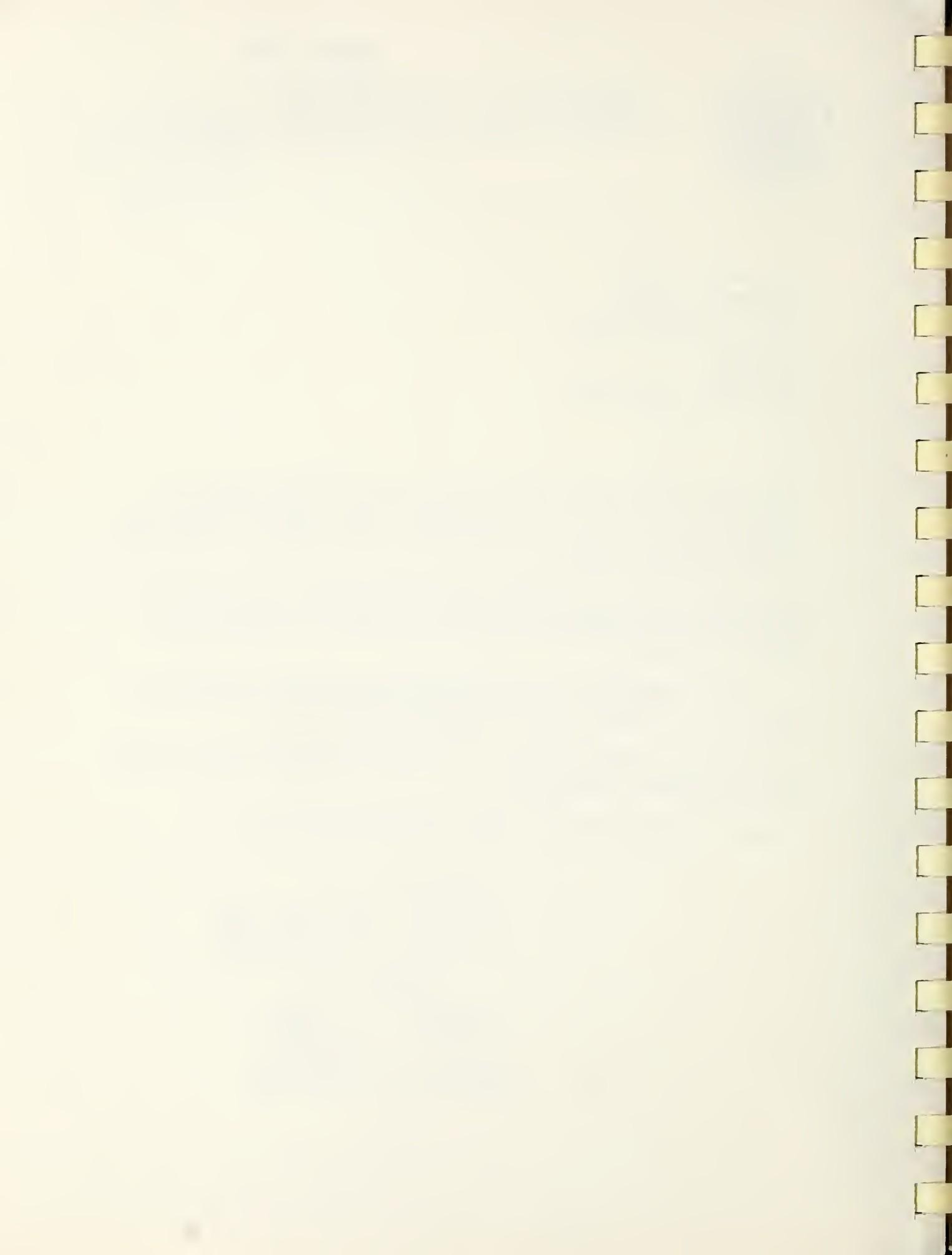
The Department of Transportation has no other comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W.E. Caldwell

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant





DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

APR 17 1975

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
Department of Agriculture
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

We have reviewed the draft Environmental Impact Statement concerning the Anderson River Watershed, Indiana. We have reviewed the impacts of the proposed action from the standpoint of this Department's areas of concern and find that we do not have any comments to make.

Thank you for the opportunity to review the document.

Sincerely,

A handwritten signature in cursive ink that appears to read "Charles Custard".

Charles Custard
Director
Office of Environmental Affairs

